UNIVERSITY OF CALIFORNIA—COLLEGE OF AGRICULTURE.

AGRICULTURAL EXPERIMENT STATION.

REPORT

OF THE

VITICULTURAL WORK

DURING THE SEASONS 1887-93,

WITH

DATA REGARDING THE VINTAGES OF 1894-95.

BEING A PART OF THE REPORT OF THE REGENTS OF THE UNIVERSITY.

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REPORT

OF THE

Professor of Agriculture and Director of the Experiment Station

TO THE

PRESIDENT OF THE UNIVERSITY.

UNIVERSITY EXPERIMENT STATION.

E. W. HILGARD, PH.D., LL.D., *Director.*

VITICULTURAL DIVISION.

A. P. HAYNE, PH.B., *Assistant in Charge.*

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F. T. BIOLETTI, B.S., *Foreman of Cellar; Ampelographer and Botanist.*

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EXPERIMENT STATIONS OF THE UNIVERSITY OF CALIFORNIA,

1894-95.

CENTRAL STATION (Berkeley, Alameda County).

E. W. Hilgard, Ph.D., LL.D. (Professor of Agriculture), Director and Chemist.
E. J. Wickson, M.A. (Associate Professor of Agriculture, Horticulture, and Entomology), Superintendent of Agricultural Grounds.
R. H. Loughridge, Ph.D. (Assistant Professor), Agricultural Geologist and Agricultural Chemist.
C. W. Woodworth, M.S. (Assistant Professor), Entomologist.
W. A. Setchell, Ph.D. (Professor of Botany), Botanist.
M. E. Jaffa, Ph.B., M.S. (Assistant Professor of Agriculture), First Assistant Chemist in Agricultural Laboratory.
Arthur P. Hayne, Ph.B. (Instructor), Assistant in charge of Viticulture and Olive Culture.
Geo. E. Colby, Ph.B. (Instructor), Second Assistant Chemist in Viticultural Laboratory.
C. H. Shinn, A.B., Inspector of Stations.
F. T. Bioletti, B.S., Foreman of Viticultural Cellar.
Emil Kellner, Foreman of Station Grounds.
Wm. Winterhalter, Clerk to the Director.

SIERRA FOOTHILL CULTURE SUB-STATION (near Jackson, Amador County).

R. C. Rust, Patron; Jackson.
George Hansen, Foreman; Jackson.

SOUTHERN COAST RANGE CULTURE SUB-STATION (near Paso de Robles, San Luis Obispo County).

S. D. Ayres, Patron; Paso Robles.
A. V. Stubenrauch, Foreman; Paso Robles.

SAN JOAQUIN VALLEY CULTURE SUB-STATION (near Tulare City, Tulare County).

John Tuohy, Patron; Tulare City.
Julius Forrer, Foreman; Tulare City.

SOUTHERN CALIFORNIA CULTURE SUB-STATION (near Pomona, Los Angeles County).

C. F. Loop, Patron; Chino (appointed June, 1896).
J. W. Mills, Foreman; Pomona.

CHICO FORESTRY SUB-STATION (near Chico, Butte County).

R. F. Pennell, Patron; Chico.
A. B. Boland, Foreman; Chico.

SANTA MONICA FORESTRY SUB-STATION (near Santa Monica, Los Angeles Co.).

Roy Jones, Patron; Santa Monica.
J. H. Barber, Foreman; Santa Monica.

VITICULTURAL SUB-STATION (under private auspices).

East Side Santa Clara Valley Station; Mission San José, Alameda County. John Gallegos, Patron; Mission San José.

COURSES IN AGRICULTURE AT THE UNIVERSITY OF CALIFORNIA.*

AGRICULTURAL CHEMISTRY—

1. *General Course.* (*a*) Chemistry and Physics of Plants, three times a week during the first term. (*b*) Soils and theory of Culture, three times a week during the second term. Professor Hilgard and Assistant Professor Loughridge.
2. *Vinification.* Lectures twice a week during the first term, with practical cellar-work. Mr. Hayne and Mr. Bioletti.
3. *Agricultural and Viticultural Laboratory.* Twelve to fifteen hours a week during both terms. Assistant Professor Jaffa and Mr. Colby.

3*a*. *Analyses of Foods* (*human and animal*) *and Food Products.* Lecture once a week and six hours laboratory during second term. Assistant Professor Jaffa.

AGRICULTURE AND HORTICULTURE—

4. *General Course.* Three times a week during both terms. Associate Professor Wickson.
5. *Viticulture and Olive Culture.* Twice a week during the second term. Mr. Hayne.
6. *Special Courses* given as called for.

ENTOMOLOGY—

7. *Elementary and Economic Entomology.* (*a*) Lectures and laboratory work, twice a week during the first term. (*b*) Supplementary laboratory work, once a week during the first term. Assistant Professor Woodworth.
8. *Apiculture.* (*a*) Lectures, laboratory, and apiary work, twice a week during the second term. (*b*) Supplementary laboratory and apiary work, once a week during the second term. Assistant Professor Woodworth.
9. *Parasitic Plant Diseases.* Lectures twice a week during the first term. Assistant Professor Woodworth.
10. *Systematic Entomology.* Lectures three times a week during the second term Assistant Professor Woodworth.
11. *Structural Entomology.* Lectures three times a week during second term. Courses 10 and 11 are given in alternate years. Assistant Professor Woodworth.
12. *Entomological Laboratory.* Two or three times a week throughout the year. This course can only be taken with or after Courses 9, 10, or 11. Assistant Professor Woodworth.

AGRICULTURAL SEMINARY—

13. Elementary course for study of current agricultural literature, once a week during both terms. Associate Professor Wickson and other Instructors.

PRACTICAL WORK AT CELLARS AND VINEYARDS—

Students who have taken the course in viticulture can avail themselves of arrangements made with the best wine-makers and merchants for special opportunities to pursue, under the auspices of the University, such lines of work as will familiarize them with vinification and viticulture as practiced at large establishments in the city or country. Students showing special aptitude are enabled to earn good wages from the first; others merely work for their board. After working under University auspices at one or more establishments they are assisted in the pursuit of further information at the viticultural laboratory as opportunity offers.

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*In addition to the general requirements in mathematics, literature, languages, and general sciences; for detailed description of which see the General University Register.

The regular course leading to a degree requires four years, and is intended to turn out agricultural *experts.* Students not expecting to graduate can enter for shorter courses as "*Specials*," to obtain such instruction as they may desire.

LETTER OF TRANSMITTAL.

President MARTIN KELLOGG:

I transmit herewith the report of viticultural work done since the last report was issued, up to and including the vintage of 1895, so far as the latter can at present be usefully reported upon; including, also, a summary report on the white-wine grapes under cultivation in California, and their wine-making qualities; being the continuation and conclusion of the report already published in 1892, on the red-wine grapes grown in the State.

The publication of this report has been purposely delayed, for the reason that the depression of the wine industry in the State, and the consequent lack of interest on the part of grape-growers, seemed to render such publication inexpedient for the time. Now that that industry is again becoming more profitable, and is likely to be placed upon a more rational basis than has been the case heretofore, it seems proper to place before those interested all the facts and results which may conduce to a better understanding both of the methods of wine-making, and of the materials employed therein. This seems the more appropriate since, by an Act passed at the last session of the Legislature, the technical work of the State Viticultural Commission was transferred to the College of Agriculture; thereby materially changing and enlarging the scope of the work to be prosecuted hereafter. Up to the time when this Act, and the appropriation accompanying it, became effective, the viticultural work of this department was necessarily almost wholly confined to the laboratory and office, as there were no funds available for traveling, and for field and winery experiments. Although the appropriation accompanying the Act of transfer is quite small (being only one fourth to one fifth of the amount annually expended by the late Viticultural Commission), it permits of sufficient expansion to change materially the scope of the work; and for this reason alone it seems proper to make a final report upon what was done on the old plan. That work has now progressed so far as to form a solid and definite basis of facts for guidance in the preparation of the several classes and grades of wines, by ascertaining experimentally, as well as chemically, the peculiarities of each variety of grapes cultivated on a commercial scale within the State. It is merely a question of time when, instead of the confusion thus far prevailing in the classification of California wines, conformity to the commercial standards recognized all over the world will be established. That, in order that this may be accomplished, the investigation of the fundamental qualities (including the chemical composition) of each variety of grapes is a prerequisite, hardly requires discussion.

It is high time that the haphazard methods even yet so commonly pursued in this State, should be discarded, and that the experience had, whether in the winery or in the laboratory, should be gathered into a definite form, as a guide to the rational wine-maker; so that hereafter California wines may appear on the world's market under their own

labels, instead of being, as has heretofore been too largely the case, disguised under foreign ones, when of good quality; while the poorer qualities were sure to be placed upon the market with the true statement of their California origin. California wine-makers must now avail themselves of the rapid and important progress made in Europe, in the preparation of the best wines possible from a given material. They must, above all, avail themselves of what experience has been had in climates similar to ours, instead of attempting each one to pursue the method of his own country, no matter how different in climatic and soil conditions. It is high time that the pernicious axiom once promulgated to the public, that "any fool can make wine," should be discarded by the viticulturist for the conviction that wine-making is a technical branch requiring special knowledge of no mean order, particularly when the industry is pursued under new conditions, such as prevail in California; and that while the experience of their forefathers has enabled European peasant wine-makers to produce good wines by following a definite procedure in certain localities, it will not do for us to blindly follow their lead. As a matter of fact, the introduction of scientific methods in European wine-making has increased enormously the amount of good wines now available in the world's market; and if we want to compete with these, it will be necessary to avail ourselves of the same progressive methods.

A very notable improvement in the average quality of our wines has occurred within the last five or six years, and the high excellence of the product obtained in so many cases renders any further continuance of slipshod methods inexcusable. What has been done once can be done again; and, with the organization of grape-growers and wine-makers now happily effected, it is reasonably to be expected that pecuniary reward will follow the application of rational principles in wine-making. In that respect, the chemical work at this station has been very instructive, as will be seen from inspection of the tables. The same varieties in different localities, such as Mission San José on one hand and Tulare on the other, show so widely different composition as to render the same variety wholly unadapted to one place while eminently fitted for the other. It is now generally understood that the same grape-variety grown in hot southern localities increases in sugar and loses in acid, as compared with a northern one; but the *extent* to which this occurs varies exceedingly with different grapes. In some the variation is very slight; while in the case of others the deterioration of wine-making qualities becomes such as to wholly throw out of consideration some of the grapes most highly favored elsewhere. On the other hand, some varieties of which it was fully expected that they would prove deficient in wine-making qualities in the southern localities, have on the contrary proved remarkably successful. And this occurred with some varieties from which such behavior was wholly unexpected. It will therefore well repay the intelligent wine-maker who desires to plant a vineyard, or to graft over unsatisfactory vines, to study these results carefully.

Respectfully,

E. W. HILGARD,
Director.

THE COMPOSITION AND CLASSIFICATION OF GRAPES, MUSTS, AND WINES.

By E. W. HILGARD.

The report herewith submitted to the public, and more especially to the grape-growers and wine-makers of the State, may be considered as marking the termination, for the present, of systematic investigation of grape-varieties with respect to their composition and general wine-making qualities in the different regions of the State. The method and final object of this work is stated in former reports, but it seems not unnecessary to re-introduce the main portion of that statement by way of introduction and explanation:

The plan adopted in this matter is in conformity with my view, shared by the best vintners in the State: that among the first necessities of the present situation of California wines in the world's market, is the establishment of more definite qualities and brands, resulting from a definite knowledge of the qualities of each of the prominent grape-varieties, and of their influence upon the kind and quality of the wine, in blending before, or, as the case may be, after fermentation; of the treatment required by each in the cellar, during the time of ripening; and finally, of the differences caused by difference of location, climate, etc., as well as by different treatment of the wines themselves.

To this end, a definite knowledge of the character and special wine-making qualities of each kind of grape serving in the preparation of wine, is indispensable. In the wine-producing countries of Europe this knowledge has been acquired by long experience; and chemical investigation has subsequently in a great measure ascertained the natural conditions upon which the attainment of certain results in wine-making depends. The principles thus evolved can be applied to new conditions, such as those existing in California, and thus save to a great extent the laborious and costly experimenting which has been gone through heretofore, by formulating into generally intelligible rules the knowledge which otherwise usually remains the trade secret of a few experts.

The first step to such knowledge is to obtain a definite idea of the material to be treated; and, curiously enough, however numerous are the analyses of ready-made European wines already on record, there are comparatively few cases in which the must from which they were produced was also investigated in so definite a manner as to lead to broad generalizations. Clearly, what is needed is that first the must, and then the corresponding wine of the more important grape-varieties, should be made the subject of detailed investigation, and that the wine should have been produced from the must under definite, or definitely varied conditions, with absolute certainty of the purity of materials, as well as of the precise manner of operating in each case. This cannot, as a rule, be depended upon in large wineries, where the exigencies of the supply, pressure of work and weather, the necessary employment of raw hands, and above all, the necessity of yielding to financial considerations, impose limitations and uncertainties that can but rarely be controlled at will. When this *can* be done, the large-scale experiments are of course by far the more decisive and cogent, and of the greatest practical value.

In an experimental laboratory, the quantities operated upon are of necessity relatively small; and it is highly important that allowance be made for this circumstance, as well as for other points in which the "wholesale" practice must always differ from the small-scale one. For instance: the management of the temperature of the fermenting-room is easier in a large winery properly constructed than in a small experimental room and with small quantities of must, which are very quickly affected by changes of temperature such as would have remained unnoticed and without influence upon the great masses in the winery. This difficulty is very apparent in the record of the course of temperatures in fermentation.

Nevertheless, we are thus enabled to obtain a very close estimate of the results obtainable from a given variety on the large scale, and of the part that each will play when blended either before or after fermentation. Few grape-varieties will, like the peerless Riesling, by themselves produce the best possible product. The art and science of blending is scarcely second in importance to the possession of good raw materials, soils, and climates; and while its last refinements depend upon a corresponding refinement of indi-

vidual taste and judgment, there is a large part of it that can be intelligibly codified, thus preventing a waste of good materials upon unmerchantable wines.

Even the most cursory consideration, however, shows that this cannot be the work of one or of even a few years; but, like all other agricultural experiences and experiments, must be extensively repeated in order to become the basis of general practice. The same grape-varieties grown in different localities and in different years will differ materially in their composition; and it is only by extended comparisons of these through a number of years that the accidentals can be definitely segregated from the essentials. Hasty generalizations, based upon limited experience, are the bane of all experimental work, especially in agriculture.

It should be fully understood and remembered that while peculiarities and defects shown by analysis are perfectly definite indications as to the conditions that *must* be fulfilled in a successful blend, yet analysis cannot as yet take cognizance of the delicate and almost intangible flavors or "bouquets," which must likewise be made to harmonize, in order to satisfy a cultivated palate. To that extent the determination of the proper blends must always remain with the expert wine-taster; but the work of the latter is immensely facilitated by being informed, through the analysis, of the prominent chemical peculiarities, which in any case must be taken into consideration, and which ordinarily are left to laborious and more or less blind guessing or experimenting.

To this method it has been somewhat captiously objected that, as the chemical composition is not the determining factor of the commercial value of wine, the chemical analysis of musts and wines cannot serve as a clew to the quality to be obtained. It has also been said that wines produced on the small experimental scale, which is the only one possible with the means at our command, are incapable of furnishing a definite clew to the results of vinification on the large scale.

These objections, however, are wholly untenable; they would, if correct, prove the inutility of laboratory work in all the great achievements of industrial progress upon which our modern life is based.

As a matter of fact, for the first six months there is practically *no* difference between wines made *by the same method and with the same care*, in large and small quantities. It is at that age that wines are mostly sold by the producer to the dealer. After that time the development of the wines in the small package is much more rapid, and therefore somewhat different from that of the large one; the small package is also more difficult to handle and care for, and in a *winery* will usually soon pass beyond control. In an experimental cellar, where special and close supervision is given, a closer approximation to large-scale results is possible, and as our record abundantly shows, wines can there be carried to maturity, and their essential general qualities satisfactorily observed. When a good, mature wine has been made on the small scale, it is indisputable that the same can be done in the winery, and probably with greater ease. If, on the other hand, the result should be unsatisfactory, the nature of the particular difficulties in the way of success can be determined and verified, so as to forewarn the large-scale producer of their nature, and suggest the precautions to be used in avoiding them.

It is idle to pretend that such results are of no practical value. They have been again and again verified afterward in winery practice; and but for them, we would still be in dense ignorance of the essential features of most of the grape-varieties now growing in the State, when grown in different climatic regions. Moreover, of a large number of varieties here reported upon, only small experimental quantities were and still are available; so that their treatment on a small and inexpensive scale was the only possible mode of obtaining *any* information regarding them. To wait until some one should think of cultivating and testing them on the large scale would be to omit to do precisely that for which experiment stations have been established the world over; namely, to obtain probable indications of what are *likely* to be the

results of large-scale practice, so as to prevent the useless expenditure of labor and money upon costly large-scale trials at haphazard.

As a *reductio ad absurdum*, it has been proposed to establish, on the part of the State, a large experimental vineyard and winery, where such experiments could be made on a "practical" scale. Aside from the enormous expense of creating, maintaining, and properly working even *one* such establishment, and the rather unsatisfactory experience had with much less difficult and complex work undertaken at State expense, it is abundantly obvious that unless several of them were created, or else the grapes were shipped by the carload to great distances from the extreme ends of the State, only a very limited region could be benefited by the enterprise, which would quickly collapse of its own cumbrous weight. No other grape-growing country has thought it necessary to burden the public purse with any such extravagant arrangement.

As to the cogency of chemical work: It is perfectly understood that certain conditions of chemical compositions *must* be fulfilled to render possible the production of certain kinds of wine at all; and while the exact quality and kind of the aroma to be produced cannot be thus foretold, it is absolutely certain that in the *absence* of such chemical conditions certain desirable qualities will invariably be found lacking. Thus, it is universally understood that a certain minimum of acidity is required in a must in order to obtain a sound and complete fermentation, and that a certain class of aromas are indispensably dependent upon the presence of such acids in adequate amounts. Hence the quantitative determination of these acids alone is invaluable in forming a judgment of the best use to be made of different kinds of grapes, whether in blending in the vat, or in blending the wine after fermentation. This is so true that when the acids are known to be insufficient they are often added at heavy expense by the purchase of tartaric acid, in order to secure a good fermentation and a high flavor. Even unripe grapes are sometimes added to the fermenting-vat for the purpose of supplying this acid without such expense.

It has also been alleged that the taste of expert tasters is a better guide to the acidity and astringency in wine than is chemical analysis. But in the presence of sugar or much tannin, the best expert taster will often find himself completely at a loss as regards the real amount of acid present, and he will make grievous mistakes in blending, whether before or after fermentation. Yet this proper proportion in blending in the vat frequently cannot be remedied to advantage after the wine is made. In the best case, the blender will be wasting time by laborious and random trial of various blends, to which a knowledge of the chemical composition would have given him a direct clew.

In the case of Clarets, their distinctive quality of allowing a considerable dilution with water without disturbing the proper proportion of the tannin and acids, rests wholly upon the fact that acid and tannin must stand to each other within definite limits of proportion, beyond which no Claret capable of standing the dilution test can be produced. Other wines, such as Burgundies, are never expected to be diluted with water; a very slight addition of such will surely destroy its character, as the apparent proportion between acid and tannin changes completely after such a wine is diluted. This quality also, then, is entirely dependent upon certain amounts of, and proportions between, acid and tannin, of

which by chemical analysis we readily ascertain the existence or absence, whether in the grape or in the wine.

So, also, the qualities of "body," smoothness, and others, are largely dependent upon certain definitely ascertainable chemical data. The keeping qualities, likewise, are largely conditioned upon chemically ascertainable conditions. It is thus obvious that in a new country like California, in which the specific wine-making qualities of most of the various grapes grown in the State are as yet unknown quantities, the determination of their chemical peculiarities can render the most essential practical service to the wine-maker, whether in determining the best adaptation of varieties already planted, or in the selection of those best adapted to his locality and purposes.

The time will doubtless come when some special type or types of wine, resulting from peculiar climatic conditions, and the multiplicity of grape types introduced, will be developed in California. But the time for this has hardly come as yet; the most pressing need now is to find a market for our wines, and to that end the most direct path lies through measurable conformity to established commercial types and qualities; based, not upon mere nominal imitation of the blends of varieties thus used in Europe, but upon an actual knowledge of what our climatic and soil conditions have made of those varieties, and how we can treat and blend them in order to conform to the established tastes of the world.

CLASSIFICATION AND TYPES.

Classification of Wines.—The commercially established classification of wines, as it exists in the European wine-making countries, must for the present at least, naturally guide California wine-producers also, as far as possible, if they desire their share of the world's commerce. To some extent it has been done in a tentative way heretofore; we hear of Bordeaux or Claret, of Burgundy, Riesling, and Sauterne, as well as of Port, Sherry, and Madeira. But if we examine somewhat critically, or sometimes even quite superficially, a great many of the wines sold under certain denominations, we find striking and almost ludicrous discrepancies between their character and that which is understood by the same name in Europe. One designation which has been used with reasonable correctness is Claret or Bordeaux wine; these are dry wines of rather high or medium acidity and tannin contents, which at the same time *will bear dilution with water* without disturbing the palatable ratio between acid and tannin. But when we come to the various California wines sold under the name of Burgundy, we find included therein such an utterly discrepant medley of different types, that the only possible definition at the present time seems to be "a red wine that will not bear dilution with water without losing its character"; and even this distinction is far from being always maintained. Thus, one sample sent to this laboratory for examination under the name of Burgundy, showed not less than 8 promille of acid and 4½ promille of tannin; it was, therefore, a highly acid and tannic wine, unsuitable for direct consumption, and belonging most decidedly to the Claret type of blending material. Then, at the same time, other samples come to us, approaching much more nearly the true character of Burgundy wines; namely, having a low proportion of acid and very light tannin, and incapable of resisting even a slight

dilution with water without losing their zest, and of a red or orange-red tint of very slight intensity. Such wines approach more closely the type of the French Burgundy; but how can it be expected that any one ordering a "Burgundy" wine, and expecting something similar to what is so called in French commerce, should be satisfied with a wine of high acidity and astringency, such as that mentioned above, which stands on the opposite end of the scale from the true Burgundies? The term is now widely used in this indefinite manner by growers and wine-merchants; but it seems of the highest importance that this mischievous misnomer should be discontinued as early as possible, by all who are interested in the good name in the commercial world, of California wines and wine-makers. No doubt the failure of the characteristic grape of Burgundy (the Pinot) to yield satisfactory crops and wine-making results in California, is responsible to a large extent for the confusion that has arisen in regard to the Burgundy type. As the Pinots are characterized by low acid, high sugar, and low color, other grapes possessing similar characteristics, and sometimes grapes not possessing any of them, were included within the group; and thus we find in different vineyards seven or eight varieties growing under the name of Burgundy. Such varieties are Chauché noir, Trousseau, Robin noir, Cinsaut, and several others; the visible characters of these grapes differ so widely from that of the Pinot group proper that it was evidently only the superficial similarity of the *wine* that has led to the misnomer. Unfortunately, the designation has been extended to one important grape, the so-called Crabb's Burgundy, now recognized as being identical with the Refosco of northern Italy; an excellent wine-making grape, approaching the Claret type, and especially useful in that connection. This is probably the most mischievous of the misnomers of Californian nomenclature, as it causes the largest disappointment to those who order California wines for their own consumption, under the supposition that the type is measurably true to the French one.

Of other commercial classes of wine, the Sauterne type is probably the one that has adhered most closely to the typical grape product of the Gironde; largely because, naturally, the California climate is better adapted to the production of the Sauterne than of the Rhenish type of white wines. The latter class is here largely comprehended under the term "Riesling," which has been indifferently applied to almost any white wine, of whatever flavor, that possesses a high degree of acid, no matter how heavy its body, and how unlike the true Rhenish type.

Now, it is useless to attempt to ignore the fact that the California climate is particularly ill adapted to the reproduction of the kinds of wine which are produced near the northern limit of wine production in Europe. It is only in locations close to the coast, and protected from the warm rays of the summer sun, that anything similar to the true Rhenish type can be expected to be produced in California; it is idle to expect that anything properly resembling the Rhenish wines can be produced in the hot *valleys* of the Coast Range, from the same grape that produces it in the old country. The hill country of the coast ranges has done much better. It was at one time thought that the higher locations in the Sierra Nevada foothills also might produce such wine; but experience has shown that, on the contrary, the western Sierra slope is more specially adapted to wines corresponding to those of the south of Europe than to anything resembling those of the Rhine and

the Moselle. In order that these types may be imitated with any degree of accuracy, new blends must be devised and different characters of grapes used, specially qualified *here* to form such wines, to which the flavor of the noble Riesling is imparted by an adequate blend. The use of the so-called Burger in this connection has, in the Napa, Sonoma, and Santa Clara valleys, proven measurably satisfactory; but there are other varieties, as yet but little cultivated, which will render similar and perhaps even superior services.

In European publications and ampelographies, the grape-varieties, if classified at all, are usually arranged in accordance with their botanical resemblances. But for practical purposes it is much better and more rational to classify them, as nearly as may be, *according to their wine-making qualities*, and their practical value for the grape-grower and wine-maker. That such a classification can, even in the best case, be only approximately correct and consistent, is a matter of course; not only because, according to the method of treatment, different wines may be made from the same grape in the same locality, but more usually because the same grape in a *different* locality may, in its wine-making qualities, belong to a totally different class. Thus the Carignane forms an acceptable material as a Claret grape in the Santa Clara Valley and other northern portions of the State; while at Fresno and southward, the character of the Carignane is wholly changed, as it loses both color and acid and can only serve as a blend with other grapes of the Southern French type. The classification given below can, therefore, be considered only as approximate, as it must, in most cases, be materially modified according to the location in which the grape is grown.

Among the white grapes the "Burger"* is a notable example of a totally changed type when grown farther southward; for at Fresno its wine assumes much more nearly the character of a Sauterne, so that no one conversant with the wines made by this grape in the Napa and Sonoma valleys would ever suspect that it was the same variety that produces good dry white wines in the Fresno and Tulare regions. The Burger certainly belongs to the southern regions of Europe, and seems to be at its best in the warm valleys of the interior of the State. The Zinfandel also shows a remarkable change from Napa to Fresno, as is shown in the following little table:

	Alcohol.	Acid.	Tannin.	Body.
Zinfandel, second crop; average of northern localities	10.6	.70	.060	2.4
Zinfandel, second crop; average of Fresno	12.5	.55	.255	3.0

The Fresno second crop is almost precisely of the same composition as the first crop at the north, and makes a fairly good dry wine; while the Fresno first crop makes an inferior product, mostly only fit for the still.

Many similar examples might be given; but this may suffice to show the necessity of *testing one and the same grape in different localities* before we can fully recognize its qualities for wine-making purposes. These examples emphasize strongly the need of experimental stations in the

*The true Burger of Germany is a wholly different grape.

different portions of the State, where such experimental growths can be made systematically, and independently of local private interests that might be involved in the results; which will obviate the need of costly experimentation by growers themselves, by informing them beforehand how best to attain the end they may have in view.

Enumeration and Definition of Types.—Below is given a summary characterization of the chief types of commercial wines, with a view of the composition of commercial samples of the same, from European analyses; together with a list of the chief grape-varieties producing them, and a brief discussion of the differences observed in the same grapes and types in California, in our investigations, as well as by intelligent growers. It is one of the objects of this presentation of the subject in condensed and systematic form, to bring out the experience of growers in different portions of the State with respect to the nature of the grapes and wines in their districts. It is fully expected that some will disagree with the classification here given, in accordance with their local experience; and all such facts and data will be welcomed as an addition to the stock of observation yet required to place the production of California wines upon a thoroughly rational basis.

In the list of principal varieties under each type, those which in some localities have shown qualities that would entitle them to a place in another type, are indicated by italics.

RED-WINE TYPES.

Bordeaux or Claret Type.

Characteristics.—Medium alcohol, acid, tannin, and body; good, violet-red color; fresh taste, and full vinous flavor.

Principal Varieties.—Cabernet Sauvignon, Cabernet Franc, Verdot, Merlot, Malbeck, Teinturier, Gamai Teinturier, Charbono, *Tannat, St. Macaire.*

Composition. (According to the analyses of European commercial Medocs.)

	Alcohol by Volume.	Acid as Tartaric.	Tannin.	Body.
Maximum	11.5%	.70%	.200%	2.7%
Minimum	8.5	.45	.150	2.0
Average	10.5	.58	.175	2.3

Our California wines, made from the several Medoc or Bordeaux red-wine varieties, differ notably in composition from the average given above. While the acid content is nearly the same as in French wines, these are almost, without exception, heavier in alcohol and body. The most marked difference, however, is in the tannin, which is generally double, and often three times as high in the California as in the commercial French wines of this type. This does not necessarily mean that so great a change has been wrought in the nature of the grape, but more probably that the French wine-makers and wine-blenders adapt the composition to the tastes of their countrymen, and of the world at large.

The St. Macaire is placed here because of its origin in the Bordeaux

district, and of its being used as a blend with Medoc wines. The character of its wine, however, would, in most cases, place it by the side of the Petit Bouschet in the Southern French type.

Rhenish Type—Red.

Characteristics.—Very nearly related to the Bordeaux type as regards the high-class wines, especially the Affenthaler. The common red wines are mostly quite light-colored.

Principal Varieties.—Affenthaler, Arbst, Blauer Burgunder.*

Composition. (According to König, of Germany.)

	Alcohol by Volume.	Acid as Tartaric.	Tannin.	Body.
Common wines—				
Maximum	11.00%	.70%	.250%	3.0%
Minimum	8.00	.40	.100	2.4
Average	9.70	.53	.175	2.7
Auslese wines—				
Maximum	14.00	.66	.250	4.0
Minimum	10.00	.43	.100	2.4
Average	12.50	.50	.158	3.0

The Affenthaler has in California given wines resembling in composition the most prized red wines of Germany. They have, however, more tannin than the commercial wines, and do not retain a remnant of sugar, which is often found in the German *auslese* wines to the extent of 0.25% to 0.50%; being then made from overripe, selected berries. Common red wines of Germany are largely made from the Frankenthaler or Trollinger (Black Hamburg) in conjunction with Arbst, Blauer Burgunder, and others, often blended with whites, and therefore quite light-colored.

Burgundy Type.

Characteristics.—Alcohol, body, and acid medium; astringency low; color light and tending to the orange-reds; very smooth, agreeable wines, without special aroma, but developing a fine bouquet with age.

Principal Varieties.—Pinot noir (Blauer Burgunder), Pinot de Pernand, Meunier, Gamai noir.

The Pinots in California have almost uniformly produced wines heavier in alcohol, tannin, and body, and lower in acid, than the ordinary commercial wines of the Côte d'Or. The Pinot wines of the Burgundy district vary considerably in alcoholic contents, however, according to season and location. The best have on the average 11% to 12% of alcohol by volume, though in certain years wines with 13% to 14% are produced. The wines of the plains, made principally from the Gamai noir, are much lighter in alcohol, ranging down from 11% to 8%, and sometimes lower. The average composition of Burgundy wines, according to König, Bedel, and others, is about 10.3% of alcohol, 0.6% of acid, and 2.4% of body; tannin not determined. This average doubtless includes wines both of the "Côtes" and of the plains; those of the hills having a heavy body and high alcohol. The Burgundies depend more on their peculiar smoothness, flavor, bouquet, and appear-

* Properly a Pinot, Burgundy type, but much used in blending.

ance for their distinctive character than on their alcoholic contents, which is a very variable quantity. Unlike the Bordeaux or Claret wines, dilution with even a little water destroys their zest.

Jura Type.

Characteristics.—Full alcohol, tannin, and body; deep color; very solid wines, with less natural aroma than those of the Medoc.

Principal Varieties.—Sirah, Mondeuse, César, Etraire de l'Adhui, Tinta Valdepeñas, and Persan.

Composition. (According to California analyses.)

	Alcohol by Volume.	Acid as Tartaric.	Tannin.	Body.
Maximum	13.0%	.70%	.350%	4.0%
Minimum	10.0	.45	.200	2.5
Average	12.0	.55	.250	3.0

These show a close approximation to the composition of the Bordeaux varieties as grown in California.

The table of the chemical composition of this type as given above is calculated on analyses of California wines made from Sirah and Mondeuse. The other varieties are included in the type, because they usually make wines similar in character to the above. The Tannat in some localities should be classed with this type.

Southern French Type.

Characteristics.—Alcohol, acid, tannin, and body below medium; color generally tending to orange-red; mostly thin, neutral blending wines.

Principal Varieties.—(*a*) Color light: Aramon, Cinsaut, Grenache, Ploussard, Trousseau, Bastardo, Dolcetto; (*b*) Color light or dark, according to locality: *Carignane*, *Mataro*, Piquepoul, Mourastel; (*c*) Color dark: *Beclan*, *Petit Bouschet*, *Alicante Bouschet*.

Composition. (According to European analyses.)

	Alcohol by Volume.	Acid as Tartaric.	Tannin.	Body.
Maximum	12.0%	.75%	.200%	2.5%
Minimum	8.0	.40	.100	1.8
Average	10.5	.53	.150	2.1

The wines which are taken as typical of this region are those of the plains of the Herault. Wines of somewhat higher character are made in favorable localities, especially in hilly districts, from the same varieties. The same is true in California, where the Carignane, Beclan, Mataro, and even the Bouschets will in some locations make excellent wines approaching the Jura type.

North Italian Type.

Characteristics.—Alcohol full to high, acid high, tannin medium, body full; color (except in the case of the Nebbiolo) deep, mostly violet-red; wines very rough at first, and slow to mature.

Principal Varieties.—Nebbiolo, Barbera, Bonarda, Fresa, Croetto, Favorita, Tadone, Refosco, Neiretta, Marzemino, Lagrain, Gros Mansenc.

Composition. (According to Italian analyses.)

	Alcohol by Volume.	Acid as Tartaric.	Tannin.	Body.
Piedmont—				
Maximum	14.5%	1.00%	.270%	3.2
Minimum	11.0	.60	.150	2.0
Average	12.0	.80	.220	2.7
Venetia—				
Maximum	11.5	1.20	----	3.0
Minimum	8.5	.80	----	2.3
Average	10.0	1.10	.210	2.7

This type is divided into two groups: that of the wines of the northwest, typified by those of Asti, and that of the country of the lower Po. The latter, being to a large extent grown in plains and made from the acid Refosco, are lower in alcohol and generally thinner and even more acid than the wines of Asti.

There is another type of wine made on the plains of the Po from such grapes as the Dolcetto. They are smooth wines, of little character, used for blending or for early consumption, and resemble the wine of the southern French plains.

The Piedmontese grapes have maintained their characteristics remarkably in California, showing their special adaptation to our conditions. The grapes of the eastern part of northern Italy, the Refosco, Neiretta, Marzemino, though maintaining their high acidity here, have produced more alcoholic wines than they are generally credited with in Venetia. Of the commoner, heavy-bearing varieties of this type, only the Fresa has been tested to any extent. It maintains the characteristic (strawberry) flavor which has suggested its name.

It would thus seem that the grapes of this very pronounced type, which combines in a remarkable degree the properties of high acidity and high saccharine strength, are likely to render important services to the wine industry in this State, especially in its southern portion, where the diminution of acid jeopardizes, or renders impossible, the production of sound and high-flavored wines with the varieties now in general culture.

Austrian and Hungarian Type—Red.

Characteristics.—Alcohol and body medium, acid full, tannin below medium; mostly deep colored, light, quickly maturing wines.

Principal Varieties.—Kadarkas, Grossblaue, Blue Portuguese, Zinfandel.

Composition. (According to European analyses.)

	Alcohol by Volume.	Acid as Tartaric.	Tannin.	Body.
Maximum	13.5%	1.00%	.280%	3.4%
Minimum	8.0	.50	.060	1.4
Average	11.3	.67	.150	2.5

The marked special flavor of the Zinfandel distinguishes it from the other members of this group, but on the whole it is best classed with this somewhat miscellaneous group. Some of the most valuable of the red-wine varieties of southern Austria are placed in the North Italian group, on account of their close resemblance to the grapes of the valley of the Po.

WHITE-WINE TYPES.

Rhenish Type—White.

Characteristics.—(*a*) Common wines: Alcohol low, acid high, body medium to low; clean, fresh-tasting, but neutral wines; (*b*) High-class wines: Alcohol, acid, and body medium, sometimes low; extremely fresh-tasting and aromatic.

Principal Varieties.—White ("Johannisberg") Riesling, Franken Riesling, Traminer, Ruländer, Orleans (Orleans Riesling of California), Kleinberger, Elbling, white and blue.

Composition. (According to König.)

	Alcohol by Volume.	Acid as Tartaric.	Body.
Common and Moselle wines—			
Maximum	8.50%	1.30%	3.00%
Minimum	6.00	.70	1.80
Average	7.30	1.00	2.30
High-class Rhine wines—			
Maximum	12.00	1.00	3.00
Minimum	10.00	.40	1.80
Average	11.50	.50	2.50

The finest and most renowned of these wines are mostly made of the White (Johannisberg) Riesling and Traminer. The Zierfahndler and Ruländer make less aromatic wines, while the neutral blending wines of Franconia are made principally from Franken Riesling and Gutedel (Chasselas). None of the Rhenish grapes make, in California, wines at all approaching in character the common wines of the banks of the Rhine and its tributaries. The Rieslings in some localities make wines of similar composition to that of the finer Rhine wines, but these usually lack freshness and attain too large an amount of alcohol. The Traminer, Ruländer, and Zierfahndler almost always contain too much sugar for complete fermentation. The Gutedel (Chasselas) in some places makes a smooth, neutral wine of moderate alcoholic strength, but it is generally lower in acid here than in Germany, and for that reason this variety has been grouped with the Southern French type, it being derived from that region.

The wines of the Moselle, peculiar for their high aroma, associated

with high acid and extremely low alcohol (6% to 8%), are mostly made from the Rieslings.

Burgundy Type—White.

Characteristics.—The white wines of the Burgundy district are of similar character to the red, but are in general more alcoholic. The white wines of the red and white Pinots range in alcoholic contents from 11% to 14%, and even as high as 15%. The white wines of the Gamais vary from 9% to 10% of alcohol, and are used principally for blending. They serve for cutting with the more alcoholic Pinot wines to make a standard blend of 11% to 12% of alcohol for the manufacture of champagnes.

Principal Varieties.—Pinot Chardonay, Pinot blanc, *Franc Pinot*, Gamai blanc, and *Gamai noir*.

Sauterne Type.

Characteristics.—(*a*) Hauts Sauternes: Alcohol and body high; smooth, aromatic, liquorous wines, slightly sweet; (*b*) Graves: Lighter and drier wines, with less aroma.

Principal Varieties.—Semillon, Sauvignon blanc, Muscadelle de Bordelais, Sauvignon vert, Folle blanche.

Composition. (According to European analyses.)

	Alcohol by Volume.	Acid as Tartaric.	Body.
Hauts Sauternes—			
Maximum	15.50%	.75%	3.6%
Minimum	12.00	.65	3.2
Average	13.50	.70	3.4
Graves—			
Maximum	12.30	.71	....
Minimum	11.20	.54	....
Average	11.50	.63	2.0

The analyses of our California Sauternes show lower acidity than is indicated by available analyses for French Sauternes. The composition of the naturally fermented wines in general show a closer resemblance to the white wines of the Graves than to the Hauts Sauternes. The above figures for body show that the profuse amount of sugar allowed in some California Sauternes is not at all in accordance with the composition of the French prototype, which cannot much exceed 1% of unfermented sugar.

Southern French Type—White.

Characteristics.—(*a*) Wines of the plains: Alcohol and body low, acid medium; thin, neutral wines; (*b*) Wines of the hills: Alcohol and body higher; smoother, and more solid wines, but with little character.

Principal Varieties.—Clairette blanche, Marsanne, Roussanne, Verdal (Aspiran blanc and rouge), Chauché gris, Ugni blanc, Chasselas, Listan, *Aramon*.

There is really no distinctive type of white wine peculiar to southern France, though there are certain varieties of grapes characteristic of the region. The white wines of the south of France may be divided into three classes: (*a*) The common wines of the plains, having from 9.5%

to 12% of alcohol by volume, and made principally from Terret, Piquepoul, and Aramon; (*b*) The finer dry white wines, such as Picardans, grown on higher ground, having from 11.0% to 16.0% (average 13.5%) of alcohol by volume, and produced principally by the Clairette blanche; (*c*) The sweet Picardans, Muscats, Roussillon, and other "vins de liqueur." The last class is the most renowned, but the varieties which produce it are not included here, as they have been placed in the liqueur wine group.

For the purpose of the present arrangement the first two classes are considered as forming the white Southern French type. The high alcoholic strength found in some wines of this class is due to a light fortification which is given to some, even of the dry wines.

Austrian and Hungarian Group—White.

Characteristics.—The dry white wines of Austro-Hungary are so diverse that it is difficult to include them in one type. They should more properly be divided into four sub-groups:

1. Fine wines made from the best Rhenish grapes; somewhat heavier and less aromatic than the Rheingau wines.

2. Good table wines, alcohol and acid full, body light. Principal varieties: Wälschriesling, White Velteliner, Rothgipfler, Zierfahndler, Peverella, Furmint, Vernaccia.

3. Lighter table and blending wines, low in alcohol, smooth and clean-tasting. Principal varieties: Rother Steinschiller, Slancamenka, Bakator.

4. Thin, poor wines, low in alcohol and very high in acid, made from heavy-bearing varieties, the principal of which is the Heunisch.

Composition. (According to Austrian analyses.)

	Alcohol by Volume.	Acid as Tartaric.	Body.
1. Average	12.00%	.60%	2.3%
2. Maximum	13.00	.80	----
2. Minimum	11.00	.50	----
2. Average	12.00	.65	2.0
3. Average	10.00	.55	----
4. Average	9.00	.85	----

The grapes of the second and third classes are included in this group. Those of the first class have been discussed with the Rhenish type. Those of the fourth class are undesirable, and have never been tried in California.

A comparison of the above data with the detailed data regarding the composition of the wines of the various grapes in the different localities of this State, will render the intelligent grape-grower and wine-maker an important service in making up proper selections of grapes for his particular locality, or purpose, as the case may be. If more European analyses of wines made from a *single* grape-variety were available, it

would doubtless be found that their composition of musts and wines agrees much more closely between Europe and California than now appears from the comparison of the commercial types with our analyses. But, with the single exception of the high-class Riesling wine, all European wines are blends of several varieties, adapted to the taste of the consumers for whom they are destined. Moreover, but very few of the named wines usually sold in California approach with any degree of closeness to their European prototype; for these are, almost throughout, the product of a judicious blending process, which as yet has been very imperfectly developed in California. For, with us, wines have mostly been named more according to the grape of which they are produced; or, if blended, the blend has been guided merely by taste, and that frequently by one not of the most practiced kind. High alcohol, high body, high tannin, have in the past been chiefly spoken of as the desiderata in this State; so that, in fact, until within the last few years the valuation has actually been based largely on the alcohol percentage alone. With such methods of procedure, both in vinification and in blending, it is no wonder that, even where the quality of wine has been good or excellent, constancy of character has been almost unattainable.

I am convinced that, with the proper understanding and utilization of the data given in this report, much of the uncertainty and haphazard heretofore prevailing will disappear, and that both in the selection of the grape-varieties to be planted, and of the proper blends to be made for particular purposes and types, the data imparted by analyses and the records of vinification will be found of the greatest practical use.

PART I.

Investigations of Various Types of Grapes, their Adaptability to Different Localities, and their Value for Wine-Making and Other Purposes; Made During the Seasons of 1887–1894.

By F. T. Bioletti.

Analyses of Musts and Wines.

Made by George E. Colby.

SPECIAL VITICULTURAL STATIONS (under private auspices) that have supplied material for the work here reported:

*__West Side Santa Clara Valley Station__; Cupertino, Santa Clara County. John T. Doyle, Patron; Menlo Park.

__East Side Santa Clara Valley Station__; Mission San José, Alameda County. John Gallegos, Patron; Mission San José.

*__Fresno Station__; Fresno City, Fresno County. E. B. Rogers, Patron; Fresno.

* Discontinued.

DESCRIPTION OF GRAPES RECEIVED AND WINES MADE, WITH ANALYSES OF MUSTS AND WINES.

NOTE.—The classification of grapes and wines here given is made for convenience of reference, in accordance with the most usual or most prominent characters; but of course is not absolute, since one and the same grape may, according to climate, location, and treatment, be made to yield a great variety of wines.

The descriptions of a number of the grape types and varieties originally prepared by Prof. Hilgard for former reports, have, for the most part, been materially increased and rewritten by Mr. Bioletti.

[It will be noticed that in many cases the sugar in the must is higher than the "solid contents by spindle." The error is in the latter determination for the condition, of the must has much to do with the accuracy of the spindle. If in a "mushy" state, the instrument fails to reach its proper level, even on repeated trials, and even when the must has been strained. Filtering is too slow a process and is not practiced in the wineries. In the tables of analyses given in this report, when such discrepancies appear, the sugar test must be regarded as the more reliable.

When grapes are received for examination, it sometimes happens that they are in a partially dried condition, with some of the sugar in a crystallized form. This sugar would, of course, pass into solution in the fermenting-tank; but in the sample taken for the must analysis, some of it would remain undissolved and be lost from the determination of "sugar by copper." The wine would, in such cases, show a greater amount of alcohol than apparently called for by the sugar in the must. Such discrepancies also appear in the tables of analyses, and are to be thus accounted for. (Geo. E. Colby.)]

A. RED-WINE GRAPES.

(Continued from the Report of 1892.)

BORDEAUX, OR CLARET, TYPE.

(For other matters regarding these wines, refer to Vit. Rept. 1887–89, pp. 31–38.)

The production of good, light, clean-tasting table wines has made great progress in California in late years, and among our finer wines of this type it is not hard to find many which have a close and creditable resemblance to the better Medocs. Unfortunately, however, there is still too much wine which aims at the reproduction of this type, but which fails by reason of its harshness, its headiness, its lack of freshness, or its green and undeveloped taste. Wines made from Medoc varieties grown in the most favorable localities are apt to be too rich in the

ingredients of good Clarets; they have too much color, too much tannin, too much alcohol, and occasionally too much acid. In fact, they contain all the essentials of good wine, but in too concentrated a form.

It is certainly an improvement to dilute these wines in the making, with a judicious amount of pure water, but this diminishes the body, flavor, and vinosity, and is incompatible with the best results. For commoner wines, the practice of picking the grapes when they show a certain percentage of sugar, say 22 %, is occasionally found useful, but if this rule is followed the grapes will often be gathered before maturity, and the resulting wine will be thin, harsh, and green, and lack the fullness and aroma of a fine wine. The best method is to gather the grapes at perfect maturity and blend them in the fermenting-vat, or as soon as possible, with the product of some sound, neutral grape, such as the Aramon, which will dilute their sugar, color, and astringency without injuring their flavor and vinosity. To avoid the extraction of too much color or tannin, an obvious and rational way is to draw the wine off the pomace at the right time—that is, when the desired amount of color and astringency has been extracted. This, with the rich Medoc varieties, will be before the sugar has disappeared, and if care be taken to maintain the proper temperature, there need be no dangerous check of fermentation. It is the practice with some of the best wine-makers to press wines of this type when they show as high as from 8 % to 10 % of solid contents by the saccharometer. This insures a smooth wine, not too rich in color or tannin, the effect being especially noticeable in the latter ingredient. Drawing off too early must, however, be avoided, or the wine will be flat and lacking in astringency. The pomace, when this early pressing is adopted, contains a large amount of color, tannin, and aromatic principles, which make it very valuable for use in the manufacture of good piquettes or even blending wines.

A slow, cool fermentation is also of great effect in avoiding the harshness which these wines are apt to develop. This is well illustrated by the experience of the Algerian wine-makers, who, since the use of refrigerators has become general, are enabled to produce wines which, after some slight blending and manipulation in Bordeaux, are given to the consumer as genuine Medocs. If this be possible in the dry and heated climate of Algeria, there can be little doubt of the efficacy of the same treatment under the more favorable conditions which obtain in California.

CABERNET SAUVIGNON.

(See Vit. Rept. 1883-85, p. 86; 1886, p. 70; 1887-89, p. 43.)

This variety, the most famed of all red-wine grapes, has now been extensively tried in California, successfully in some places, with poor results in others. In cool localities, where the soil is fairly rich, it is a vigorous grower, shades its grapes well, and bears fair crops. In warmer localities, and on light or dry soil, it is apt to lack enough foliage to properly shade the grapes. This can generally be remedied by close planting and judicious summer pruning. It is a good variety for localities subject to early spring frosts, on account of the late starting of the buds. The berries are solid, well attached to the stalk, and resist rain very well.

The must reaches a good percentage of sugar with sufficient acid.

The average for the coast counties is about 23% to 25% of sugar, with 0.60% to 0.40% of acid. It ferments well, and the wine is one of the best keepers tested. One of the most invaluable qualities of this grape is the exceptional cleanness of the bunches; that is, the absence of rotten, moldy, or broken grapes. This quality has led to its successful use in the making of "levains" or yeasts with which to start other grapes and insure a prompt and pure fermentation.

The greatest faults of the wine of the Cabernet Sauvignon are its excessive astringency and sometimes excessive color. These may be called good faults, for they are easily remedied by blending, and are among the principal causes which make this wine such an excellent keeper. Wines made from this grape in the localities where it attains its highest qualities are so rough, even at the end of three or four years, that they are not agreeable to use alone. One of the best blends for California seems to be one half Cabernet Sauvignon and one half Beclan. The addition of Beclan moderates the tannin, acid, and color of the Cabernet without destroying or disguising its individuality. The usual French blends with Verdot, Merlot, or Malbeck are not suitable for our conditions, as these varieties all possess in a greater or less degree the faults of the Cabernets. At Tulare, the behavior of the Cabernet Sauvignon has been somewhat of a surprise; where the alkali is not too strong, it grows thriftily, makes plenty of foliage, and bears about two to three tons per acre. In strong alkali it is subject to coulure and sunburn. The berries are small, and with little or none of the Cabernet flavor; they are, however, juicy, with fair acid, and make a wine of good color and fair quality, inferior, however, to that of Mondeuse from the same vineyard.

Analyses of Musts and Wines.

CABERNET SAUVIGNON.		MUST.					WINE.							
		Date of Picking	Solid Contents by Spindle	Sugar Test by Copper	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At Six Months	Body	Ash
1890—No. 1248.	Margherita Vineyard, Fresno	Aug. 25	22.40	21.80	.65	.32							
No. 1342.	Mission San José	Oct. 11	22.90		.62	.26	9.12	11.36	.252		.40	2.78	
No. 1347.	Cupertino	Oct. 12	24.80		.40								
1891—No. 1554.	Paso Robles	Oct. 6	25.65		.41								
No. 1591.	Mission San José	Oct. 14	25.40	24.11	.44								
1892—No. 1662.	Amador station	Sept. 16	22.95		.57								
No. 1750.	Paso Robles	Oct. 11	24.80		.31								
No. 1765.	Mission San José	Oct. 12	21.95	21.22	.77		8.70	10.83	.199	.69	.63	2.85	
1893—No. 1820.	Amador station	Sept. 6	22.70		.80	.21							
No. 1892.	Tulare	Sept. 21	23.70	20.99	.37								
No. 1914.	Paso Robles	Oct. 6	24.80	25.19	.53	.23	9.34	11.64			.46	3.10	.23
No. 1950.	Mission San José	Oct. 14	22.10		.58								
1894—No. 2207.	Tulare	Sept. 25	25.50	24.12	.39								
No. 2282.	Amador station	Oct. 4	25.45	23.61	.53								
No. 2303.	Mission San José	Oct. 11	29.00		.47								

Color Readings.

CABERNET SAUVIGNON.	At Pressing.		One Month.		Two Months.		Three Months.		Four Months		Five Months.	
1892—No. 1765. Mission San José	125.0	1VR	74.2	1VR	72.8	1VR	72.8	1VR	56.3	1VR	43.0	2VR
1893—No. 1914. Paso Robles	55.5	1VR	27.0	3VR	23.5	3VR	25.0	5VR	11.1	1R	9.3	2R

RECORD OF TREATMENT.

No. 1248. *Cabernet Sauvignon*, from Margherita Vineyard, Fresno. A small sample arrived August 26, 1890, in good condition, well ripened, but both bunches and berries very small. The must showed 22.4% of solid contents. This sample was fermented with No. 1250, Merlot.

No. 1342. *Cabernet Sauvignon*, from Mission San José. Received October 14, 1890, in good condition, and mature. The must showed 22.9% of solid contents by spindle. The temperature of the must at crushing was 68°, and on the fourth day the cap had risen to 86°, and the violent fermentation was over; the next day the wine was dry.

In three weeks from crushing the wine was clear. At four months the wine was racked for the second time, and was bright, much improved, with good flavor, tannin, and acid, but a slightly suspicious taste. A month later the lees showed a few lactic ferments, and the wine was pasteurized. At seven months it was bright and generally good but for its odor. At fourteen months the wine had been racked four times, and was bright, possessed of a full and characteristic flavor, but was somewhat thin and exhausted and had a slight butyric odor. Two months later it was bottled. At two years the bottled wine showed high qualities of flavor, tannin, and acid, but was spoiled by butyric odor.

No. 1347. *Cabernet Sauvignon*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 13, 1890, in fair condition, a few of the grapes moldy and some dried up. The must showed 24.8% of solid contents by spindle.

No. 1554. *Cabernet Sauvignon*, from Paso Robles. A sample for must analysis arrived October 8, 1891, in good condition. The bunches and berries were of medium size for the variety, and the grapes mature. The must showed 25.65% of solid contents by spindle.

No. 1591. *Cabernet Sauvignon*, from Mission San José. A sample for must analysis arrived October 16, 1891, in fair condition. The must showed 25.4% of solid contents by spindle.

No. 1662. *Cabernet Sauvignon*, from Amador station. A sample for must analysis arrived September 19, 1892, in good condition. The must showed 22.95% of solid contents by spindle.

No. 1750. *Cabernet Sauvignon*, from Paso Robles station. A sample for must analysis arrived in good condition. The must showed 24.8% of solid contents by spindle.

No. 1765. *Cabernet Sauvignon*, from Mission San José. Received October 15, 1892, in good condition. The must showed 21.95% of solid contents by spindle. The temperature of the must at crushing was 58°, and the maximum temperature reached was 84°, on the fourth day. On the fifth day the wine was nearly dry, and was pressed.

The wine was somewhat slow in clearing, but at three months was bright and showed rich aroma and flavor, with medium acid and astringency. It improved gradually, preserving its pronounced flavor, and finally losing the slight moldy smell which it had at first. At fourteen months it was very good, but not mature. At twenty-one months it was bottled.

No. 1820. *Cabernet Sauvignon*, from Amador station. A sample for must analysis arrived September 8, 1893, in good condition. The bunches were loosely but fairly well filled with small berries. The grapes had some of the Cabernet flavor. The must showed 22.7% of solid contents by spindle.

No. 1892. *Cabernet Sauvignon*, from Tulare station. A sample for must analysis arrived September 23, 1893, in good condition. The bunches were small and coulured; the berries small, sunburned, and flavorless, but very sweet. The must showed 23.7% of solid contents by spindle.

No. 1914. *Cabernet Sauvignon*, from Paso Robles station. Received October 6, 1893, in fair condition. The bunches and berries were both of good size, the former somewhat affected by coulure. The grapes were well flavored. The must showed 24.8% of solid contents by spindle. The temperature at crushing was 63°, and the maximum reached was 83°, on the fourth day. The fermentation was a little slow toward the end, and the murk was pressed out while still a little sweet. It was left in the fermenting-room for two days after pressing, and at the end of that time was dry.

The wine was nearly clear at the end of six weeks, but was extremely rough. At three months it was bright, possessed of high flavor and aroma, full but agreeable astringency, medium acid, and high body. At seven months it was in excellent condition, and generally a fine wine, but the Cabernet character was not very pronounced.

No. 1950. *Cabernet Sauvignon*, from Mission San José. A sample for must analysis was received October 14, 1893, in bad condition. The bunches were small, well filled with berries of good size. The grapes were highly flavored and mature, but had become moldy by being too long on the road, so were not made into wine. The must showed 22.1% of solid contents by spindle.

CABERNET FRANC.

(See Vit. Rept. 1883-85, p. 84; 1886, p. 68; 1887-89, p. 38.)

The success of this variety has been much more limited than that of its congener, Cabernet Sauvignon. This is partly owing to the fact that unless the cuttings used in planting are carefully selected from well-bearing vines, they are apt to give unproductive or absolutely sterile vines. It is also more deficient in foliage than Cabernet Sauvignon, and in dry soils is liable to be badly sunburned. Close training on wires, and careful summer pruning, may be relied on to counteract this tendency.

Further analyses of this variety show that it maintains its character of full sugar contents, with medium to low acid. A sample of wine made from grapes grown at the Paso Robles station shows the usual high body and medium astringency of this variety; its color was at first good, but lacked stability.

ANALYSES OF MUSTS AND WINES.

CABERNET FRANC.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1891—No. 1522. Mission San José	Sept. 29	26.95	26.31	.44	-----	-----	-----	-----	-----	-----	-----
No. 1559. Paso Robles	Oct. 6	23.50	-----	.58	-----	-----	-----	-----	-----	-----	-----
1892—No. 1762. Paso Robles	Oct. 11	22.85	-----	.50	-----	-----	-----	-----	-----	-----	-----
1893—No. 2070. Paso Robles	Nov. 3	26.70	25.76	.43	.30	9.92	12.36	.262	.49	.36	3.15
1894—No. 2294. Mission San José	Oct. 10	23.20	-----	.36	-----	-----	-----	-----	-----	-----	-----

COLOR READINGS.

CABERNET FRANC.	At Pressing.		One Month.		Two Months.		Three Months.		Four Months.	
1893—No. 2070. Paso Robles	59.7	VR	38.4	2VR	33.6	5VR	32.8	4VR	8.3	(Y)

RECORD OF TREATMENT.

No. 1522. *Cabernet Franc*, from Mission San José. A sample for must analysis arrived October 1, 1891. The must showed 26.95 of solid contents by spindle.

No. 1559. *Cabernet Franc*, from Paso Robles. A sample for must analysis arrived October 8, 1891, in good condition. The grapes were large for the variety, and mature. The must showed 23.5 of solid contents by spindle.

No. 1762. *Cabernet Franc*, from Paso Robles. Received October 14, 1892, in good condition. The must showed 22.85 of solid contents by spindle. The grapes were fermented with No. 1761, Tannat, from Paso Robles.

No. 2070. *Cabernet Franc*, from Paso Robles. Received November 3, 1893, in fair condition. The bunches were of medium size, very much branched, irregular, loose, coulured; the berries small, well flavored, but overripe. The must showed 26.7 of solid contents by spindle. The temperature of the must at crushing was 66°, and the maximum of 80° was reached on the third day. The wine was dry on the fifth day, when it was pressed.

The wine was clear at the end of a month, but tasted bitter. At the end of two months it had been racked twice, was clear, very heavy-bodied, with a fairly good flavor, but flat.

MERLOT.

(See Vit. Rept. 1887–89, p. 54.)

This variety has been as distinct a failure in California as the Malbeck, and for the same reason—viz., failure to bear, added to which is its liability to loss of its leaves from sunburn. This is somewhat strange, as in Europe it has the reputation of being a heavy bearer. There, however, it is only planted on cool, northern slopes, for in other positions it ripens too quickly and is easily injured by the sun. The grapes have a very agreeable and distinctive flavor, similar to that of the Cabernet Sauvignon, not, however, perceptible in the wine, which is of a neutral character.

The composition of such grapes as have been analyzed at the station show the effect of growing on too warm an exposure. The sugar contents have been higher on the average, and the acid lower, than in the case of any other of the Bordeaux grapes. The Merlot is particularly unsuited to the Paso Robles district, as, judging from the observations made at that station, and from the analyses of musts received from there, its defects are emphasized and it loses much of its flavor and color.

ANALYSES OF MUSTS AND WINES.

MERLOT.		Date of Picking	MUST.				WINE.	
			Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Tannin.	Total Acid as Tartaric at Pressing.
1890—No. 1218.	Fresno	Aug. 22	23.70	.....	.28	.....	.....	.....
No. 1366.	Cupertino	Oct. 14	26.30	.....	.38	.....	.....	.....
No. 1380.	Mission San José	Oct. 19	28.80	.....	.40	.....	.....	.....
1891—No. 1586.	Mission San José	Oct. 14	25.90	24.96	.36	.44	.....	.....
1893—No. 1955.	Paso Robles	Oct. 15	28.40	28.33	.29	.33	.326	.41
No. 1993.	Mission San José	Oct. 19	25.90	.....	.58	.....	.451	.68
No. 2060.	Cupertino	Oct. 31	26.30	.....	.51	.....	.294	.74
1894—No. 2259.	Mission San José	Oct. 3	23.70	.....	.49	.....	.....	.....

COLOR READINGS.

	MERLOT.	At Pressing.	
1893—No. 1955.	Paso Robles	27.4	5VR
No. 1993.	Mission San José	121.0	VR
No. 2060.	Cupertino	48.2	3VR

RECORD OF TREATMENT.

No. 1218. *Merlot*, from Margherita Vineyard, Fresno. A sample for must analysis arrived August 25, 1890, in good condition, overripe, and some of the grapes dried. The must showed 23.7% of solid contents by spindle.

No. 1366. *Merlot*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 17, 1890, in good condition, a little overripe, the berries a little shriveled, but not dried up. The must showed 26.3% of solid contents by spindle.

No. 1380. *Merlot*, from Mission San José. A sample for must analysis arrived October 20, 1890, in fair condition, mature, and a few of the grapes dried. The must showed 28.8% of solid contents by spindle.

No. 1586. *Merlot*, from Mission San José. A sample for must analysis arrived October 16, 1891, in fair condition. The bunches were loose and straggling, the berries small. The must showed 25.9% of solid contents by spindle.

No. 1955. *Merlot*, from Paso Robles. A sample for must analysis and for color and tannin tests arrived October 15, 1893, in fair condition. The bunches were large, irregular, loose, and winged; the berries small, round, on long, slender pedicels. The grapes were of good flavor, and mature. The must showed 28.4% of solid contents by spindle.

No. 1993. *Merlot*, from Mission San José. A sample for must analysis and for color and tannin tests was received October 19, 1893, in good condition. The bunches were of medium size, irregular, loose, and branching; the berries small; the peduncles and pedicels very slender. The grapes were mature and highly flavored. The must showed 25.9% of solid contents by spindle.

No. 2060. *Merlot*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received October 31, 1893, in good condition. The bunches were small, spreading, well filled, but not close; the berries small, round, firm, of characteristic flavor, quite mature. The must showed 26.3% of solid contents by spindle.

MALBECK OR CÔT.

(See Vit. Rept. 1883-85, p. 83; 1886, p. 87; 1887-89, p. 32.)

The latest tests of the Malbeck have developed no new points in its favor, but have, on the contrary, proved pretty conclusively its unfitness for Tulare and similar localities. It has not borne well at any of the stations; at Paso Robles, where it has done best, it gave less than two tons to the acre. On the whole, it seems better adapted to the conditions at Paso Robles than at any other locality tried so far; it gives a wine of good body, acid, and astringency. It commenced with an amount of color equal to that attained at Cupertino, but dropped it very badly. It has in this locality shown the excellent quality of retaining a good amount of acid, even when somewhat overripe and very high in sugar. In general, the composition of the must is satisfactory wherever the variety has been grown; but so far no locality has been tested where it overcomes its radical defect of unfruitfulness (in consequence of coulure or failure to set), which at Mission San José has continued to characterize it to such extent as to amount to absolute failure.

ANALYSES OF MUSTS AND WINES.

MALBECK.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
1890—No. 1303. Mission San José	Oct. 5	24.55	.....	.56	.38	.....	.....	.....	.....	.....	.....
No. 1321. Cupertino	Oct. 11	25.20	.....	.53	.....	.....	.....	.....	.....	.....	.....
1891—No. 1475. Fresno	Aug. 29	25.00	24.64	.55	.51	.....	.....	.....	.....	.....	.....
No. 1489. Paso Robles	Sept. 9	28.80	29.07	.54	.....	.....	.....	.....	.....	.....	.....
1892—No. 1653. Paso Robles	Sept. 13	22.15	21.80	.53	.34	.....	.....	.....	.....	.....	.....
No. 1665. Amador station	Sept. 16	24.25	.....	.58	.....	.....	.....	.....	.....	.....	.....
No. 1679. Tulare	Sept. 17	22.80	.....	.44	.....	.....	.....	.....	.....	.....	.....
1893—No. 1797. Tulare	Aug. 31	21.10	18.99	.62	.45	7.43	9.27	.298	.51	.67	3.80
No. 1817. Amador station	Sept. 8	21.50	20.99	.78	.26	.....	.....	.294	.72	.....	.....
No. 1917. Paso Robles	Oct. 7	26.30	24.64	.50	.38	9.85	12.20	.272	.48	.44	3.30
No. 2055. J. T. Doyle, Cupertino	Oct. 31	25.20	.....	.62	.....	.....	.....	.384	.90	.....	.....
1894—No. 2208. Tulare	Sept. 20	22.60	.....	.53	.....	.....	.....	.....	.....	.....	.....
No. 2274. Mission San José	Oct. 3	22.60	.....	.50	.....	.....	.....	.....	.....	.....	.....

COLOR READINGS.

MALBECK.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1893—No. 1797. Tulare	33.3 1VR	32.5 5VR	19.1 R	17.6 2R	17.4 2R	.....
No. 1817. Amador station	70.2 1VR	.....	.....	.....	.....	.....
No. 1917. Paso Robles	90.9 VR	35.4 1VR	27.9 1VR	28.8 2VR	9.3 (Y)	8.7 (Y)
No. 2055. Cupertino	90.9 VR-1VR	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1303. *Malbeck*, from Mission San José. A sample for must analysis arrived October 7, 1890, in bad condition. The must showed 24.55% of solid contents by spindle. The grapes were fermented with No. 1302, Tannat, from Mission San José.

No. 1321. *Malbeck*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 13, 1890, in bad condition. The must showed 25.2% of solid contents by spindle.

No. 1475. *Malbeck*, from Margherita Vineyard, Fresno. A sample for must analysis and color test arrived August 31, 1891, in fair condition. The must showed 25.0% of solid contents by spindle.

No. 1489. *Malbeck*, from Paso Robles station. A sample for must analysis arrived September 11, 1891, in good condition. The must showed 28.8% of solid contents by spindle.

No. 1653. *Malbeck*, from Paso Robles station. A sample for must analysis and color test arrived September 16, 1892, in good condition. The must showed 22.15% of solid contents by spindle.

No. 1665. *Malbeck*, from Amador station. A sample for must analysis arrived September 19, 1892, in poor condition. The must showed 24.25% of solid contents by spindle.

No. 1679. *Malbeck*, from Tulare station. A sample for must analysis arrived September 21, 1892, in good condition. The must showed 22.8% of solid contents by spindle.

No. 1797. *Malbeck*, from Tulare station. Received August 31, 1893, in good condition. The bunches were well filled, the berries of good size and well colored, but tasteless. The must showed 21.1% of solid contents by spindle. The must at crushing had a temperature of 63°, and was very slow in starting. On the fifth day the fermentation was so slow that it was hastened by placing the vat in an outside temperature of 90°. This had the desired effect, and in three days more the wine was dry. The maximum temperature reached was 96°, on the seventh day.

The wine became clear in a month, but soon commenced to deteriorate. At three months it was very flat and inferior, and at seven months quite spoiled.

No. 1817. *Malbeck*, from Amador station. A sample for must analysis and for color and tannin tests was received September 8, 1893, in good condition. The bunches were close, medium sized; the berries of medium size and good flavor. The must showed 21.5% of solid contents by spindle.

No. 1917. *Malbeck*, from Paso Robles station. Received October 7, 1893, in somewhat crushed condition, but not moldy. The bunches were small, but well filled; the berries of medium size, very ripe, and of good flavor. The must showed 26.3% of solid contents by spindle. The initial temperature of the must was 68°, and the maximum temperature reached, on the third day, 84°. The fermentation was finished on the sixth day.

Three weeks from pressing, the wine was nearly clear and was very astringent. At three months it was clear, of good color and flavor, full-bodied, and with plenty of astringency, but not quite clean-tasting. At seven months it had improved and developed some bouquet, but the after-taste was not good and was slightly bitter.

No. 2055. *Malbeck*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 31, 1893, in good condition. The bunches were small and coulured; the berries of medium size, crisp, juicy, well flavored, and quite mature. The must showed 25.2% of solid contents by spindle.

VERDOT.

(See Vit. Rept. 1883-85, p. 88; 1885, p. 71; 1887-88, p. 60.)

The Gros and the Petit Verdot seem to be simply variations of the same variety produced by selection; the former is a better bearer and produces larger berries. But there is little or no difference in the character of the wine. This variety has succeeded much better than either the Malbeck or the Merlot, bearing fair crops and, though possessing a less dense foliage, generally shading its grapes sufficiently. It is vigorous, but requires long-pruning and a fairly rich soil. The young canes are brittle and liable to damage from the wind in the spring. The average crop in suitable soil is about three to four tons per acre, but

less when the soil is too light or too dry. The average crop at Cupertino has been about two tons per acre. At Tulare the crop has been about the same, but the vine does not do well in alkali soil.

The Verdot ripens later than the Cabernets, and while attaining an almost equal amount of sugar, retains a much higher acidity. The average composition of the must in ordinary years is—at Cupertino, 24.5% of sugar and 0.86% of acid; at Mission San José, 24.5% of sugar and 0.84% of acid; at Tulare, 24% of sugar and 0.53% of acid; at Paso Robles, 24.2% of sugar and 0.47% of acid. This shows good acidity, even at the southerly stations. The must is thus easily fermented, and produces a wine of excellent keeping qualities. The wine is very astringent, but less rough at first than Cabernet Sauvignon, to which, however, it is much inferior in distinctive flavor. Its most profitable use is as a blend with high-class wines needing an addition of acid and tannin.

ANALYSES OF MUSTS AND WINES.

VERDOT.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At 6 to 8 Months	Body
1890—No. 1223. Fresno	Aug. 22	23.70	23.62	.57	.33						
No. 1250. Fresno	Aug. 25	24.10	23.62	.57	.27	9.70	12.09	.278	.41	.57	3.08
No. 1331. Cupertino	Oct. 1	21.05		.92							
No. 1382. Mission San José	Oct. 18	25.00		.99	.23	9.92	12.36	.320		.39	3.32
1891—No. 1551. Paso Robles	Oct. 6	23.40		.39							
No. 1592. Mission San José	Oct. 13	24.00	24.11	.82	.40	10.44	11.91	.291	.67	.49	3.20
1892—No. 1681. Tulare	Sept. 19	23.70		.39							
No. 1726. Paso Robles	Oct. 10	25.90		.48							
No. 1736. Paso Robles	Oct. 10	20.60		.53							
1893—No. 1828. Amador station	Sept. 8	21.50		1.23				.386	1.13		
No. 1935. Paso Robles	Oct. 13	26.95	26.24	.49	.31			.534	.41		
No. 1942. Tulare	Oct. 13	22.35	21.38	.63	.23			.438	.56		
No 1991. Mission San José	Oct. 19	24.10		.92				.425	.85		
No. 2043. Cupertino	Oct. 31	25.70		1.10				.355	.94		
No. 2115. Cupertino	Nov. 6	26.30		1.15				.400	.79		
No. 2124. Cupertino	Nov. 6	25.70		1.01							
1894—No. 2306. Mission San José	Oct. 10	25.00		.64							
No. 2317. Tulare	Oct. 13	26.00		.47							

COLOR READINGS.

VERDOT.		At Pressing.	One Month.	Two Months.	Three Months.	Four Months.
1891—No. 1592.	Mission San José	120 VR	88.8 2VR	58.0 2VR	58.0 2VR	41.2 2VR
1893—No. 1828.	Amador	174 VR	111.0 1VR			
No. 1935.	Paso Robles	100 VR				
No. 1942.	Tulare	69 VR				
No. 1991.	Mission San José	133 VR				
No. 2043.	Cupertino	114 1VR				
No. 2115.	Cupertino	87 1VR				

RECORD OF TREATMENT.

No. 1223. *Petit Verdot*, from Margherita Vineyard, Fresno. A sample for must analysis was received August 25, 1890, in good condition, but a little overripe. The must showed 23.7% of solid contents by spindle.

No. 1250. *Petit Verdot*, from Margherita Vineyard, Fresno. Received August 27, 1890, in good condition. The bunches were small; the berries small, thin-skinned, and juicy. The must showed 24.1% of solid contents by spindle. The temperature of the must at crushing was 69°, and the highest temperature reached during fermentation was 92°, on the fourth day. The murk was drawn off and the pomace pressed on the sixth day, though a little sugar still remained. This sample was fermented with No. 1248, Cabernet Sauvignon, from the same vineyard. The proportion of each variety was Verdot 78%, Cabernet 22%.

Blend of Verdot and Cabernet Sauvignon. The wine fermented slowly for some time, but was quite dry at the end of a month. At two months it was clear, of fair color, medium astringency and acid, but flat and of suspicious taste. At three months the lees showed lactic filaments and the taste was affected; aside from this the wine was of rather good quality. A few days after this it was pasteurized. After pasteurizing, the wine was racked twice, and gradually improved, losing its lactic taste and becoming bright. The wine was bottled, part at eighteen months and part at twenty-four months. At twenty-eight months both wines were tasted and found bright and with fairly good color. That first bottled had the most flavor, but the other was the cleaner-tasting, though neither wine was quite fresh or clean-tasting.

No. 1331. *Gros Verdot*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 3, 1890, in good condition, and mature. The must showed 21.05% of solid contents by spindle.

No. 1382. *Petit Verdot*, from Mission San José. Received October 20, 1890, in very good condition; the bunches and berries were extremely small. The must showed 25.0% of solid contents by spindle. The temperature of the must at starting was 68°, and the maximum, reached on the third day, was 93°. The murk was dry on the fourth day, and was drawn off.

At one month the wine was clear, of good flavor, high astringency, medium acid, and full body. At three months the wine was racked for the second time and, the lees showing some lactic filaments, it was pasteurized. It was bright, of good bouquet and flavor, and the lactic tint was not perceptible to taste. At seven months it had improved, and was full flavored and very good, but still very rough. At fourteen months it had improved, and kept well in spite of the small size of the sample (three gallons), and was quite mature. At sixteen months it was bottled. At one year after bottling the wine was bright and of high quality and remarkably clean-tasting, considering the small size of the sample made.

No. 1551. *Gros Verdot*, from Paso Robles station. A sample for must analysis arrived October 8, 1891, in good condition. The bunches were small; the berries of medium size and mature. The must showed 23.4% of solid contents by spindle.

No. 1592. *Petit Verdot*, from Mission San José. Received October 16, 1891, in fair condition. The must showed 24.0% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the highest reached was 80°, on the third day. The murk was dry on the fourth day, and was drawn off.

But two gallons of wine were made, and consequently it soon became flat. It showed, however, remarkable keeping qualities, and successive tastings at one, two, four, seven, and nine months show a gradual improvement of flavor. It was put in glass at nine months.

No. 1681. *Gros Verdot*, from Tulare station. A sample for must analysis was received September 21, 1892, in good condition. The must showed 23.7% of solid contents by spindle.

No. 1726. *Petit Verdot*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The grapes were very small. The must showed 25.9% of solid contents by spindle.

No. 1736. *Gros Verdot*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 20.6% of solid contents by spindle.

No. 1828. *Gros Verdot*, from Amador station. See No. 1828, Petit Verdot.

No. 1828. *Petit Verdot and Gros Verdot*, from Amador station. A sample for must analysis and for tannin and color tests was received September 8, 1893, in good condition. The Petit Verdot was very small and coulured, the Gros Verdot had small bunches well filled with larger berries; the grapes were well colored. The must showed 21.5% of solid contents by spindle.

No. 1935. *Petit Verdot*, from Paso Robles station. A sample for must analysis and for color and tannin tests was received October 13, 1893, in good condition. The bunches were small and loose; the berries very small, mature, and well flavored. The must showed 26.95% of solid contents by spindle.

No. 1942. *Petit Verdot*, from Tulare station. A sample for must analysis and for color and tannin tests was received October 13, 1893, in good condition. The bunches were small, close, regularly short cylindrical; the berries of medium size, fresh-tasting, mature, with good acid. The must showed 22.35% of solid contents by spindle.

No. 1991. *Petit Verdot*, from Mission San José. A sample for must analysis and for color and tannin tests was received October 19, 1893, in good condition. The bunches were small to medium, well filled, but not compact; the berries small, equal, quite mature. The must showed 24.1% of solid contents by spindle.

No. 2043. *Gros Verdot*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received October 31, 1893, in good condition. The bunches were small, cylindrical, often in two branches, loose, coulured; the berries of medium size, commencing to dry up, but still with good acid. The must showed 25.7% of solid contents by spindle.

No. 2115. *Petit Verdot*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received November 6, 1893, in good condition. The bunches were under medium size, close, conical to cylindrical, with small shoulders; the berries under medium size, firm, juicy, sweet, but with very few dried berries. The must showed 26.3% of solid contents by spindle.

No. 2124. *Gros Verdot*, from J. T. Doyle, Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were over medium size, much winged, loose, on slender red peduncles; the berries of medium size, round, crisp, commencing to shrivel, but with good acid. The must showed 25.7% of solid contents by spindle.

GAMAI TEINTURIER.

(See Vit. Rept. 1885, p. 86; 1887–89, p. 71.)

This is a grape deserving of more extended attention than it has yet received. It is not a very vigorous grower, but is fairly resistant to coulure, rain, etc., and with long-pruning gives fair crops (two to four tons per acre, at Cupertino). At Tulare station it is planted in alkali too strong for any variety, but the composition of the must is very satisfactory. The grapes are of medium size, not too compact, and ripen about two weeks before the Cabernet Sauvignon. The average composition of the must in ordinary years is: at Cupertino, 23.9% of sugar and 0.82% of acid; at Mission San José, 24.7% of sugar and 0.77% of acid; at Tulare, 26.2% of sugar and 0.64% of acid; at the Amador station, 23.1% of sugar and 0.73% of acid; at Paso Robles, 23.0% of sugar and 0.68% of acid. Thus, at all stations, with a full or somewhat high percentage of sugar, it maintains uniformly a good percentage of acid. The composition of the must insures a quick and thorough fermentation; the wine is without special flavor, but full-bodied, fresh-tasting, and quick to mature.

As a color wine, it is much superior in California to the Teinturiers, in having an almost equal amount of color and superior keeping qualities. The color is particularly stable, both in tint and intensity. Though essentially in character a grape of the Bordeaux type, it would make an excellent blend for correcting the faults of our Pinots in some districts, where they are subject to the mannitic or other injurious after-fermentations. It would give them the color, acid, and keeping qualities they need, without disguising or spoiling their own peculiar flavor and bouquet.

Its tannin content, as a rule, is adequate, but not high, so that the wine is never so intensely rough as the Carbernets often are.

Analyses of Musts and Wines.

GAMAI TEINTURIER.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar Test by Copper	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1890—No. 1228. Fresno	Aug. 23	25.40	25.76	.64	.40						
No. 1276. Cupertino	Oct. 1	21.93		.80	.23	9.25	11.45	.202	.84	.52	2.58
1891—No. 1580. Mission San José	Oct. 13	26.80	26.99	.65		11.23	13.73	.307	.75	.50	2.70
1892—No. 1684. Mission San José	Sept. 24	24.10		.93		9.49	11.82	.232	.84	.86	3.10
No. 1663. Amador station	Aug. 30	25.86		.58							
1893—No. 1823. Amador station	Sept. 8	20.20		.88				.253	1.00		
No. 1866. Paso Robles	Sept. 15	23.05	20.99	.68	.24	8.48	10.58	.122	.56	.55	2.95
No. 1893. Tulare	Sept. 25	26.90	24.12	.64	.40			.317	.71		
No. 1945. Mission San José	Oct. 14	23.20		.87				.428	.86		
No. 2128. Cupertino	Nov. 6	26.50		.68				.349	.71		
1894—No. 2265. Mission San José	Oct. 3	25.65		.80							

Color Readings.

GAMAI TEINTURIER.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1891—No. 1580. Mission San José	149.0 1VR	102.6 2VR	100.0 2VR	46.5 2VR	52.0 4VR	
1892—No. 1684. Mission San José	142.0 1VR	118.0 2VR	103.0 2VR	90.9 1–2VR	81.6 2VR	69.0 2VR
1893—No. 1823. Amador station	64.5 1VR					
No. 1866. Paso Robles	22.3 R	17.4 4VR	13.4 5VR	10.5 5VR	11.9 5VR	11.1 5VR
No. 1893. Tulare	22.6 1R					
No. 1945. Mission San José	154.0 1VR					
No. 2128. Cupertino	100.0 1VR					

RECORD OF TREATMENT.

No. 1228. *Gamai Teinturier*, from Margherita Vineyard, Fresno. A sample for must analysis was received August 25, 1890, in good condition, but some of the grapes had commenced to dry up. The must showed 25.4% of solid contents by spindle.

No. 1276. *Gamai Teinturier*, from J. T. Doyle, Cupertino. Received October 2, 1890, in fair condition. Grapes small and not quite mature; a few bunches moldy. The must showed 21.93% of solid contents by spindle. The temperature of the grapes at crushing was 66°, and the highest temperature reached was 89°, on the fourth day. The murk was dry on the sixth day, and was drawn off.

The wine fermented slowly for some time and was a little slow in clearing, but in two months it was clear, with good acid and astringency, but with a slight odor of mold. At four months the lees showed a little lactic taint, so the wine was pasteurized. The lactic taint was not perceptible to taste, and the wine was clear. Four months after pasteurizing it was bright, with little bouquet but agreeable flavor, and generally improved. At ten months it was racked for the third time; at fifteen months it was bright, had rich ruby color, little bouquet, full rich flavor, with no trace of moldiness; mature, and of good quality. It was bottled—part at seventeen and part at twenty-three months. At twenty-seven months both samples were tasted. That bottled at seventeen months was flat, cloudy, and of poor quality; that bottled at twenty-three months was in excellent order, very smooth, agreeable, and clean-tasting.

No. 1580. *Gamai Teinturier*, from Mission San José. Received October 16, 1891, in fair condition. The must showed 26.8% of solid contents by spindle. The temperature of the must at starting was 68°, and the maximum temperature arrived at was 86°, on the third day. On the fourth day the murk was drawn off nearly dry.

At one month the wine was clear, smooth, and full-bodied, but a little flat. At two months the lees showed lactic germs, so the wine was pasteurized. A month later the wine was sound, but lacked freshness. At seven months it was much improved, had developed some bouquet, and tasted cleaner and fresher. It continued to improve and develop character till it was fifteen months old, when it was bottled. At three years and a half the wine in bottle was bright, deep-colored, with good flavor and some bouquet; it was a solid wine with good astringency and body, and medium acid.

No. 1684. *Gamai Teinturier*, from Mission San José. Received September 27, 1892, in good condition. The must showed 24.1% of solid contents by spindle. The temperature of the must at starting was 68°, and the highest temperature reached was 94°, on the third day. The murk was dry on the fifth day, and was drawn off.

The wine was clear within a month from crushing. At three months it was bright, the bouquet good, acid very sharp, flavor not marked. It improved with age, and at five months, when it was racked for the second time, it was smoother, but the acid was still harsh. It remained bright and sound, and at eighteen months was put in bottle.

No. 1663. *Gamai Teinturier*, from Amador station. Received September 1, 1892, in poor condition. The must showed 25.86% of solid contents by spindle.

No. 1823. *Gamai Teinturier*, from Amador station. A sample for must analysis and for color and tannin tests was received September 8, 1893, in good condition. The bunches were small and well filled, with good-sized berries, well colored and ripe. The must showed 20.2% of solid contents by spindle.

No. 1866. *Gamai Teinturier*, from Paso Robles station. Received in good condition September 15, 1893. The bunches were well filled and of good size; the berries somewhat shriveled; the juice only slightly pink. The must showed 23.05% of solid contents by spindle. The temperature of the grapes at crushing was 67°, and the highest temperature reached was 89°, on the fourth day. The murk was drawn off dry on the fifth day. In one month the wine was clear, but tasted a little moldy. At four months it was bright, very light in color for the variety, full acid and good flavor. At eight months it had been racked twice, and was much improved, had developed some bouquet, and possessed some flavor; the after-taste was not perfectly clean.

No. 1893. *Gamai Teinturier*, from Tulare station. The grapes arrived on September 25, 1893, in good condition; they were very sweet and past maturity; the bunches and berries were small; the juice slightly pink. The must showed 26.9% of solid contents by spindle. Only a sample for analysis and for color and tannin tests was received.

No. 1945. *Gamai Teinturier*, from Mission San José. A sample for must analysis and for tannin and color tests was received October 14, 1893, in bad condition, having been too long on the road. The grapes were overripe and beginning to dry up. The must showed 23.2% of solid contents by spindle.

No. 2128. *Gamai Teinturier*, from J. T. Doyle, Cupertino. A sample for must analysis and for tannin and color tests was received November 6, 1893, in good condition. The bunches were conical, close, under medium size; the berries of medium size, soft and shriveled, much overripe. The must showed 26.5% of solid contents by spindle.

TEINTURIER.

(See Vit. Rept. 1885, p. 86; 1887, p. 77.)

There are two varieties of the Teinturier, known, according to Mas and Pulliat, as Teinturier mâle (or Dix fois coloré) and Teinturier femelle (or Cinq fois coloré). They deserve mention as having been somewhat widely distributed in California, luckily only in small quantities. The former is also called in California, but erroneously, Pied de Perdrix. It is the more deeply colored, but lacks vigor and bears sparingly. The other, known generally simply as Teinturier, is slightly more productive. Neither variety can be recommended either for quality or quantity, and are both equaled if not surpassed as coloring grapes by the Petit Bouschet, Gamai Teinturier, and even by several grapes with white juice. The two varieties are easily distinguished by the leaves; those of the Teinturier mâle are red from the beginning, while those of the Teinturier femelle only turn red as they commence to mature. Moreover, the canes of the Teinturier mâle show in the cross-section a red center spot which the other does not. It is rare to find either variety with bunches having sound berries throughout.

Analyses of Musts and Wines.

TEINTURIER.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight.	Alcohol. By Volume.	Tannin	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At Six Months.	Body
1890—No. 1205. Fresno	Aug. 12	24.55	24.43	.48	.54	9.34	11.64	.210	.46	.38	3.20
No. 1235. Fresno	Aug. 23	22.00	21.80	.71	.43						
No. 1283. Cupertino	Oct. 1	25.20		.70	.32	9.92	12.36	.359	.54	.32	3.28
No. 1292. Mission San José	Oct. 1	23.60		.80	.21	9.34	11.64	.310	.71	.37	2.78
1891—No. 1497. Paso Robles	Sept. 13	21.50	20.99	.57	.33	7.99	10.00	.100	.53	.53	3.05
No. 1521. Mission San José	Oct. 1	25.90	25.19	.60		10.26	12.13	.311	.74	.59	3.05
No. 1587. Mission San José	Oct. 14	27.55	26.99	.55							
1892—No. 1666. Amador station	Sept. 17	26.25		.56							
No. 1710. Mission San José	Oct. 3	25.00		.70	.32						
1893—No. 1831. Amador station	Sept. 8	23.70		.60				.361	.75		
No. 1943. Tulare	Oct. 13	23.45		.74							
No. 1946. Mission San José	Oct. 14	25.90		.85				.547	.83		
No. 2121. Cupertino	Nov. 7	26.10		.50				.531			
1894—No. 2151. Tulare	Sept. 17	24.55		.57							
No. 2196. Amador station	Sept. 26	28.00		.33							
No. 2271. Mission San José	Oct. 5	22.70		.53				.305			

Color Readings.

TEINTURIER.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1891—No. 1497. Paso Robles	15.2 3R+Y	5.5 1VR+Y	6.2 3VR+Y	6.1 3VR+Y	6.3 5VR+Y	4.7 1R+Y
No. 1521. Mission San José	149.0 2VR	83.3 1VR	58.0 1–2VR	62.5 2VR	54.8 3VR	44.4 3VR
1893—No. 1831. Amador station	78.4 1VR	61.6 1VR				
No. 1946. Mission San José	182.0 VR					
No. 2121. Cupertino	111.0 1VR					
1894—No. 2271. Mission San José	95.2 VR					

RECORD OF TREATMENT.

No. 1205. *Teinturier mâle*, from Margherita Vineyard, Fresno. Received August 15, 1890, in good condition, perfectly ripe, and a few grapes commencing to shrivel; the bunches were of good size. The must showed 24.55% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the maximum temperature reached was 83°, on the fourth day. The murk was dry on the sixth day, and was drawn off.

The wine was clear in five weeks from pressing. It was at first coarse, but sound and full-bodied, with plenty of tannin and alcohol, and moderate acid. At four months it was bright and generally much improved, agreeably flavored, and with some bouquet. The lees, however, showed a few lactic ferments, so the wine was pasteurized. Successive tastings showed a gradual improvement up to eight months, after which the wine lost in freshness and color. At fifteen months it was bright, very lightly colored for a Teinturier, with good bouquet and flavor, but somewhat exhausted. At seventeen months it was bottled. It was tasted two years after bottling, and found bright, sound, and in good condition, without bad taste, but insipid and neutral.

No. 1235. *Pied de Perdrix*, from Margherita Vineyard, Fresno. A sample for must analysis was received August 25, 1890, in poor condition, and not mature. The must showed 22.0% of solid contents by spindle.

No. 1283. *Teinturier mâle*, from J. T. Doyle, Cupertino. Received October 3, 1890, in fairly good condition. The bunches were often undersized, with many undeveloped berries. The must showed 25.2% of solid contents by spindle. The temperature of the must at crushing was 64°, and the maximum temperature reached was 94°, on the fourth day. The murk was dry on the sixth day, when it was drawn off.

The wine was a little slow in clearing, but at two months it was clear; it was a heavy, very astringent wine of neutral flavor. At three months the lees showed some lactic taint, and the taste had become affected; the wine was pasteurized. After this the wine improved somewhat, became smoother, and retained its high color, but lacked freshness and character. At eighteen months it was bottled, but it did not keep well in glass.

No. 1292. *Teinturier mâle*, from Mission San José. Received October 3, 1890, in good condition. The bunches were well filled and the grapes mature. The must showed 23.6% of solid contents by spindle. The temperature of the grapes at crushing was 63°, and the maximum temperature reached was 87°, on the third day.

The wine was slow in clearing, and commenced to go wrong almost from the beginning; it was heavy-bodied and highly astringent. It was pasteurized at three months, and improved a little after that; it was, however, always a flat and insipid wine, and did not keep well in bottle.

No. 1497. *Teinturier mâle*, from Paso Robles station Received September 16, 1891, in good condition. The must showed 21.5% of solid contents by spindle. The temperature of the grapes at crushing was 68°, and the maximum reached was 83°, on the second day. On the third day the murk was nearly dry, and was drawn off.

Three weeks from pressing, the wine was nearly clear and quite dry. At two months it was bright, with very little color, coarse, and earthy. Successive tastings show no improvement; the wine remained clear, but was thin, flat, and without character.

No. 1521. *Teinturier mâle*, from Mission San José. Received October 2, 1891, in good condition. The must showed 25.9% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the highest temperature reached was 84°, on the fourth day. The murk was dry on the fifth day, when it was drawn off.

The wine was a little slow in clearing, and tasted flat. Within a month from pressing the lees showed lactic ferments. The wine was pasteurized at two months. After this the wine became bright and improved somewhat. It soon, however, became decrepit, owing principally, perhaps, to the smallness of the sample.

No. 1587. *Pied de Perdrix*, from Mission San José. A sample for must analysis was received October 16, 1891, in poor condition. The must showed 27.55% of solid contents by spindle.

No. 1666. *Teinturier mâle*, from Amador station. A sample for must analysis arrived September 19, 1892, in poor condition. The must showed 26.25% of solid contents by spindle.

No. 1710. *Teinturier mâle*, from Mission San José. Received October 5, 1892, in fair condition. The must showed 25.0% of solid contents by spindle. This sample was fermented with No. 1709, Bastardo, from Mission San José.

No. 1831. *Teinturier mâle*, from Amador station. A sample for must analysis and for color and tannin tests was received September 8, 1893, in good condition. The bunches were small, but the berries of good size. The must showed 23.7% of solid contents by spindle.

No. 1943. *Teinturier mâle*, from Tulare station. A sample for must analysis was received October 13, 1893, in good condition. The bunches were very small, loose, much coulured; the berries small and overripe, mixed with second crop, to which is doubtless due the somewhat high acid of the must. The must showed 23.45% of solid contents by spindle.

No. 1946. *Teinturier mâle*, from Mission San José. A sample for must analysis and for color and tannin tests was received October 14, 1893, in poor condition. The juice was very deeply colored. The grapes were not as much shriveled as the Gamai Teinturier from the same locality received the same day. The must showed 25.9% of solid contents by spindle.

CHARBONO.

(See Vit. Rept. 1887-89, p. 83.)

This variety was at first planted with some confidence, but later was almost universally discarded. It has, however, some good qualities, which should recommend it for a few localities. It is very vigorous and productive, even on poor soils; bears with short-pruning, and is very free from any disease. The bearing is more regular if the vines are pruned half-long or allowed to extend themselves on trellis or horizontal wires. At Tulare, Amador, and Paso Robles it has been pruned half-long, and has proved one of the most prolific bearers, giving nearly ten tons per acre in the alkali soil of the first mentioned station, and three tons in the light, dry, hill soil of Amador foothill station. At Tulare it produces a good deal of second crop, which colors early and is therefore difficult to separate by unskilled hands. The second crop is, however, almost ripe when the first is ready for picking, and if picked with it, aids the fermentation.

In 1893 the vines bore at the rate of about nine tons per acre, and made a fair wine, which cleared quickly and kept well; it was lacking in smoothness and delicacy, the grapes having been made up with some second crop, and the large crop having prevented the development of its best qualities. In 1894 the crop was only about five tons per acre, and the wine made was proportionally superior. The wine at five months was bright, of good color, full flavor, smooth, and agreeable. The indications are that for bearing, color, and quality, this is one of the best varieties for red wine yet tested in Tulare.

The must has contained from 20% to 24% of sugar at all the stations except those near the bay where the solid contents have seldom exceeded 20%. The acid is somewhat low at the interior stations, but there is generally enough to insure a complete fermentation—at Tulare an average of 0.45%. Except at Paso Robles, the wine has always had good color, not of the brightest tint, but maintaining itself well and not turning yellow. It is generally deficient in tannin, and often in body, and, though generally agreeable at first, becomes flat and insipid in aging. It is not a wine to be kept long or used alone, but its productiveness, good color, and neutral character make it useful as a blend with astringent, light-colored wines. It is likely to be of use, however, only to those with whom quantity is more looked for than quality.

Analyses of Musts and Wines.

CHARBONO.	Date of Picking.	MUST. Solid Contents by Spindle.	MUST. Sugar by Copper Test.	MUST. Acid as Tartaric.	MUST. Ash.	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Tannin.	WINE. Total Acid as Tartaric. At Pressing.	WINE. Total Acid as Tartaric. At Six Months.	WINE. Body.
1891—No. 1536. Paso Robles	Oct. 6	24.15	.....	.34	.....	.....	.....	.....	.....	.....	.....
1892—No. 1623. Tulare	Aug. 30	24.15	.....	.44	.....	.....	.....	.....	.....	.....	.....
No. 1730. Paso Robles	Oct. 10	20.00	.....	.51	.....	.....	.....	.....	.....	.....	.....
1893—No. 1824. Amador station	Sept. 8	19.30	.....	.74	.....	.....	.....	.320	.80	.....	.....
No. 1844. Tulare	Sept. 14	20.85	18.84	.49	.48	7.64	9.54	.141	.....	.49	3.2
No. 1934. Paso Robles	Oct. 13	23.10	21.63	.48	.34	8.48	10.58	.218	.45	.41	3.1
1894—No. 2212. Tulare	Sept. 26	24.40	.....	.41	.....	.....	.....	.....	.....	.....	.....
No. 2283. Amador station	Oct. 4	24.80	24.12	.44	.....	.....	.....	.....	.....	.....	.....

Color Readings.

CHARBONO.	At Pressing.	One Month.		Two Months.		Three Months.		Four Months.		Five Months.	
1893—No. 1824. Amador station	80.0 VR-1VR	.....		.....		.....		.....		.....	
No. 1844. Tulare	50.6 VR	31.7	VR	14.7	5VR	16.5	4VR	12.9	5VR	13.0	4VR
No. 1934. Paso Robles	48.2 R	26.0	4VR	23.6	2VR	21.1	3VR	7.7	(Y)	7.0	(Y)

RECORD OF TREATMENT.

No. 1536. *Charbono*, from Paso Robles station. A sample for must analysis was received October 8, 1890, in good condition. The bunches were very small, compact, with medium-sized berries. The grapes were mature. The must showed 24.15% of solid contents by spindle.

No. 1623. *Charbono*, from Tulare station. A sample for must analysis was received September 1, 1892, in good condition. The must showed 24.15% of solid contents by spindle.

No. 1730. *Charbono*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 20.0% of solid contents by spindle.

No. 1824. *Charbono*, from Amador station. A sample for must analysis and for color and tannin tests was received September 8, 1893, in good condition. The bunches were well filled with over-average sized berries, well colored, and with some flavor. The must showed 19.3% of solid contents by spindle.

No. 1844. *Charbono*, from Tulare station. Received September 14, 1893, in good condition, except for a few moldy bunches, which were easily picked out. The bunches were large to medium, well filled; the berries of good size, fairly well colored. There were many small, round bunches of second crop, which were nearly ripe, but much more acid than the others. The must showed 20.85% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the maximum reached was 95°, on the third day. The murk was nearly dry on the fourth day, and was drawn off on the fifth.

The wine was clear within a month, and promised well. At four months it was bright, possessed of some bouquet and flavor, full astringency and acid, but lacking in freshness. At seven months it had been racked twice, and was a wine of fair quality, but not quite clean-tasting.

No. 1934. *Charbono*, from Paso Robles station. Received October 13, 1893, in good condition. The bunches were small, cylindrical, close; the berries of medium size. The grapes were quite mature and with little acid. The must showed 23.1% of solid contents by spindle. The temperature of the must was 67° at crushing, and the maximum reached was 81°, on the third day. The murk was dry on the fifth day, when it was drawn off.

The wine was a little slow in clearing, and retained a little sweetness for over three months. At three months it was clear, full-bodied, with good aroma and flavor, low acid, very smooth and slightly sweet, but quite sound. At seven months it was quite dry and in good order. It had been racked twice, and was a good, clean-tasting wine of neutral character.

TANNAT.

(See Vit. Rept. 1883–85, p. 89; 1886, p. 72; 1887–89, p. 48.)

This variety has not been tested very extensively in California, but has many qualities to recommend it. It is a vigorous grower, generally shades its grapes well, and produces rather more freely than the Cabernets. It will bear with short-pruning in some places, but does better with long. The must is characterized by high sugar and acid. Its average composition for five years has been: at Cupertino, 26.2% of sugar and 0.82% of acid; at Mission San José, 26.1% of sugar and 0.62% of acid; at Tulare it lacks acid and the vines do not bear sufficiently; at the Amador station it is one of the best bearers, and has averaged 23.9% of sugar and 0.90% of acid. This is strongly corroborative of the opinion expressed in the Report for 1884, that the Tannat would be a valuable variety for the higher foothills of the upper part of the State. It has also done well at Paso Robles, bearing fairly well and producing a good wine with full acid, medium tannin, and somewhat higher body than is shown by the same variety in the bay counties; it also shows good and fairly stable color, but of a somewhat less pure violet-red tint.

ANALYSES OF MUSTS AND WINES.

TANNAT.

			Date of Picking.	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric.	MUST. Ash	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Tannin.	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1890	No. 1302.	Mission San José	Oct. 5	27.20		.63	.28	10.81	13.27	.237	.51	.39	3.50
	No. 1389.	Cupertino	Oct. 18	25.00		.90							
1891	No. 1573.	Mission San Jose	Oct. 1	26.40		.61							
	No. 1560.	Paso Robles	Oct. 7	23.25		.62					.63		
1892	No. 1686.	Mission San Jose	Sept. 24	25.00		.72							
	No. 1761.	Paso Robles	Oct. 11	25.90		.67		9.34	11.61	.259	.59	.50	3.25
	No. 1661.	Amador station	Sept. 16	24.85		.72							
1893	No. 1835.	Amador station	Sept. 8	20.20		1.21	.24			.330	.88		
	No. 1911.	Paso Robles	Oct. 5	25.70	25.19	.71	.29	9.70	12.00	.259	.65	.59	3.30
	No. 2079.	Mission San Jose	Nov. 2	26.20		.57				.240	.66		
	No. 2114.	Cupertino	Nov. 7	32.20		.75				.611	.71		
1894	No. 2160.	Amador station	Sept. 17	20.50		.73							
	No. 2261.	Mission San Jose	Oct. 3	25.90		.56					.58		
	No. 2322.	Tulare	Oct. 13	27.20		.37							

COLOR READINGS.

TANNAT.

			At Pressing.		One Month.		Two Months.		Three Months.		Four Months.		Five Months.	
1891	No. 1560.	Paso Robles	40.0	1VR	25.1	4VR	15.4	R	13.5	1R	16.2	3R		
1892	No. 1761.	Paso Robles	121.0	VR	83.3	VR	38.4	1VR	42.5	1VR	41.2	1VR	34.7	2 3VR
1893	No. 1835.	Amador station	40.4	2VR	41.2	2VR								
	No. 1911.	Paso Robles	80.9	VR	57.1	1VR	41.2	1VR	36.4	2VR	28.6	2VR	25.5	3VR

RECORD OF TREATMENT.

No. 1302. *Tannat*, from Mission San José. Received October 7, 1890, in bad condition. The must showed 27.2% of solid contents by spindle. The grapes were fermented with No. 1303, Malbeck, in the proportion of 46 lbs. of the latter to 41 lbs. of Tannat. The fermentation lasted six days, commencing at a temperature of 66°, and attaining a maximum of 90°, on the third day.

The wine was clear in one month, but tasted and smelled of mold. It gradually improved, and at three months, after the second racking, it showed some good qualities: good flavor, some bouquet, full astringency and body, and medium acid; the moldiness was, however, still perceptible, and the lees showed a few lactic ferments; the wine was therefore pasteurized. Four months later it was bright, but a little flat. At fourteen months it had been racked four times, and was in good order, of good color and agreeable flavor, but the mold taste still persisted. At sixteen months it was bottled, but deteriorated in glass.

No. 1389. *Tannat*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 21, 1890, in poor condition, crushed and overripe. The must showed 25.0% of solid contents by spindle.

No. 1523. *Tannat*, from Mission San José. A sample for must analysis arrived October 1, 1891, in good condition. The must showed 26.4% of solid contents by spindle.

No. 1560. *Tannat*, from Paso Robles station. A sample for must analysis arrived October 8, 1891, in good condition. The bunches were medium sized and well filled, the grapes mature. The must showed 23.25% of solid contents by spindle.

No. 1686. *Tannat*, from Mission San José. Received September 27, 1892, in good condition. The must showed 25.0% of solid contents by spindle. The grapes were fermented with No. 1685, Chauché noir, from Mission San José.

No. 1761. *Tannat*, from Paso Robles station. Received October 14, 1892, in good condition. The must showed 25.9% of solid contents by spindle. The grapes were fermented with No. 1762 and No. 1763 in the following proportions: Tannat, 28 lbs; Cabernet Franc, 22.5 lbs.; Gros Mansenc, 19 lbs.; that is to say, 40%, 32%, 28%, respectively. The temperature of the grapes at crushing was 63°, and the maximum arrived at was 80°, on the fourth day. The wine was dry in five days.

The wine cleared quickly, and at three months, having been racked once, it was bright, of good color, smooth, and generally pleasing. It improved in keeping, and at fourteen months was mature. At fifteen months it was bottled.

No. 1661. *Tannat*, from Amador station. A sample for must analysis arrived September 19, 1892, in poor condition. The must showed 24.85% of solid contents by spindle.

No. 1835. *Tannat*, from Amador station. A sample for must analysis and for color and tannin tests was received September 8, 1893, in good condition. The bunches were of good size, well filled, but showing here and there a little coulure. The must showed 20.2% of solid contents by spindle.

No. 1911. *Tannat*, from Paso Robles station. Received October 5, 1893, in good condition. The bunches and berries were small; the grapes were very sweet and somewhat past maturity. The must showed 25.7% of solid contents by spindle. The temperature at crushing was 68°, and the maximum arrived at was 85°, on the third day. The wine was dry on the fifth day.

At three weeks the wine was nearly clear and showed full acid and astringency. At three months it had been racked twice, and was clear, full-bodied, solid, of good flavor, but very rough. Four months later it had improved, developed a good bouquet, and was in general a very good wine.

No. 2079. *Tannat*, from Mission San José. A sample for must analysis and for color and tannin tests was received November 3, 1893, in good condition. The bunches were medium to small, cylindrical, with large shoulders or small wings, close below, looser near the peduncle; the berries were small and juicy. The must showed 26.2% of solid contents by spindle.

No. 2114. *Tannat*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received November 10, 1893, in good condition. The bunches were of medium to under medium size, conico-cylindrical, with one or two small wings, close; the berries small, commencing to shrivel, but with good acid. The must showed 32.2% of solid contents by spindle.

ST. MACAIRE.

(See Vit. Rept. 1887-89, p. 51.)

This variety is little known outside of the locality of the same name where it is cultivated in the Bordelais. It is a fairly vigorous vine, with good foliage, somewhat liable to *oidium* and coulure, but in good soils generally producing good crops—more abundant than the Tannat or Gros Mansenc. It requires long-pruning, and has produced at Tulare, when so pruned, an average of five tons to the acre. The must generally contains less sugar than that of the Tannat or Gros Mansenc, while in acid it is about between these. It ferments well, but the wine is not so robust a keeper as that of these two varieties. The wine has a remarkably intense color, being only exceeded by the Petit Bouschet.

The average composition of the must in ordinary years is: at Cupertino, 22.3% of sugar and 0.72% of acid; at Mission San José, 22.3% of sugar and 0.84% of acid; at Tulare, 23.0% of sugar and 0.53% of acid; at the Amador station, 24.2% of sugar and 0.86% of acid. The quality of the wine is distinctly inferior to that of the Tannat or of the Gros Mansenc, but it is more deeply colored and the vines bear more abundantly. It is thus useful as a color blend in localities where Gros Mansenc will not ripen, or for the production of a fair red wine of Claret type in localities like Tulare, where color is ordinarily lacking; it also serves to increase the acid in blends requiring it.

Analyses of Musts and Wines.

ST. MACAIRE.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar Test by Copper	MUST. Acid as Tartaric	MUST. Ash	WINES. Alcohol. By Weight	WINES. Alcohol. By Volume	WINES. Tannin	WINES. Total Acid as Tartaric. At Pressing	WINES. Total Acid as Tartaric. At Six Months	WINES. Body
1890—No. 1281. Cupertino	Oct. 1	19.90	.....	.99	.30	8.13	10.17	.294	.75	.53	3.08
No. 1295. Mission San José	Oct. 1	21.95	.....	.95	.20	8.98	11.18	.225	.77	.51	2.82
1891—No. 1443. Tulare	Aug. 26	22.40	.....	.50	.....	.....	.....	.....	.....	.....	.....
No. 1515. Mission San José	Sept. 30	22.15	21.96	1.07	.....	10.81	13.27	.301	.92	.50	2.60
1892—No. 1678. Tulare	Sept. 18	22.73	22.23	.38	.39	.....	.....	.....	.....	.....	.....
No. 1706. Mission San José	Oct. 3	20.00	19.54	1.07	.35	8.06	10.08	.309	.86	.79	3.20
1893—No. 1827. Amador station	Sept. 6	21.30	.....	1.05	.21	.....	.....	.....	.....	.....	.....
No. 1846. Tulare	Sept. 12	22.00	21.22	.74	.46	8.34	10.42	.259	.65	.52	3.30
No. 2063. Mission San José	Nov. 1	24.80	24.34	.88	.32	9.56	11.91	.243	.80	.62	3.30
No. 2116. Cupertino	Nov. 4	25.90	.....	.66	.....	.....	.....	.524	.77	.....	.....
1894—No. 2197. Amador station	Sept. 23	27.15	.....	.50	.....	.....	.....	.....	.....	.....	.....
No. 2205. Tulare	Sept. 27	24.80	.....	.52	.....	.....	.....	.....	.....	.....	.....
No. 2272. Mission San José	Oct. 3	21.90	.....	.70	.....	.....	.....	.....	.....	.....	.....

Color Readings.

ST. MACAIRE.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1891—No. 1515. Mission San José	444.0 2VR	190 0 1VR	125.0 2VR	133.3 2VR	108.0 2VR	69.0 2VR
1892—No. 1706. Mission San José	222.0 VR	174.0 1VR	126.0 1VR	125.0 1VR	118.0 1VR	97.5 1-2VR
1893—No. 1846. Tulare	138.0 VR	48.8 VR	38.8 1VR	36.0 1VR	31.0 2VR	30.3 2VR
No. 2063. Mission San José	166.0 1-2VR	142.0 1VR	133.0 1-2VR	118.0 1-2VR	90.9 2VR	....
No. 2116. Cupertino	148.0 VR	.....	.....	.....	.....	....

RECORD OF TREATMENT.

No. 1281. *St. Macaire*, from J. T. Doyle, Cupertino. Received October 3, 1890, in good condition but for a few moldy berries. The grapes were not mature. The must showed 19.9% of solid contents by spindle. The temperature of the grapes at crushing was 64°, and the maximum reached was 89°, on the fourth day. The fermentation lasted five days.

The wine in about a month was of good quality, with full acid and astringency, but had a slight moldy taste. At three months the lees showed a little lactic filaments, but the taste was unaffected; the moldy taste was, however, still faintly perceptible. The wine was pasteurized at this date. Four months later the wine was bright and improved. At fourteen months it had been racked four times, and was in good condition and of good color; it was, however, rather flat and without much character. Some of the wine was bottled at sixteen months and some at twenty-three months. Two months after bottling the wines were tasted; the first bottled was flat and not good; the second, bright, smooth, and of good flavor, but lacking in bouquet.

No. 1295. *St. Macaire*, from Mission San José. Received October 3, 1890, in fair condition, some grapes moldy and not mature. The must showed 21.95% of solid contents by spindle. The temperature of the grapes at crushing was 68°, and the maximum temperature reached was 87°, on the second day. In three days and a half the fermentation was through, and the wine was pressed.

In three weeks the wine was nearly clear, but tasted of mold. The wine was somewhat slow in clearing, but it remained sound and no bad ferments were found in the lees. At three months the wine had been racked twice and was clear and showed some good qualities. It improved gradually, and finally at the end of fourteen months had almost lost its moldy taste, was well flavored, sound, and with high acid. At two years it was bottled. At two months after bottling the wine was of good quality but for a faint remnant of the moldy taste.

No. 1443. *St. Macaire*, from Tulare station. A sample for must analysis arrived August 29, 1891, in good condition. The must showed 22.4% of solid contents by spindle.

No. 1515. *St. Macaire*, from Mission San José. Received October 1, 1891, in good condition. The must showed 22.15% of solid contents by spindle. The temperature of the grapes at crushing was 65°, and the maximum temperature reached was 86°, on the third day. The murk was nearly dry on the morning of the third day, and was pressed in the afternoon of the same day.

In one month from crushing, the wine was clear, highly acid and astringent, and with good aroma; at three months it had developed a good vinous bouquet, was clean-tasting, of good flavor, and generally very promising. Tastings at five and at ten months showed a gradual improvement and good keeping qualities, in spite of the smallness of the sample (five gallons). At fifteen months the wine still retained its freshness. A month later it was bottled.

No. 1678. *St. Macaire*, from Tulare station. A sample for must analysis was received September 21, 1892, in good condition. The must showed 22.73% of solid contents by spindle.

No. 1706. *St. Macaire*, from Mission San José. Received October 5, 1892, in fair condition. The must showed 20.0% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the maximum, reached on the third day, was 88°. The murk had finished fermenting on the fourth day, and was pressed.

At three weeks after crushing the wine was clear and showed some good qualities, but had a little taste of mold. At three months it was bright, of good flavor, and with high acid and astringency. The wine remained good, but the acid continued rather harsh, and the moldy taste never quite disappeared. At eighteen months the wine was bottled.

No. 1827. *St. Macaire*, from Amador station. A sample for must analysis arrived September 8, 1893, in good condition. The bunches were of medium size and showed no coulure; the berries were of good size, not quite mature. The must showed 21.3% of solid contents by spindle.

No. 1846. *St. Macaire*, from Tulare station. Received September 15, 1893, in good condition. The bunches were of good size and loose; the berries of good size and well colored. The grapes were mature, and the must showed 22.0% of solid contents by spindle. The temperature of the grapes at crushing was 67°, and the maximum temperature of 88° was reached on the third day. The murk was nearly dry on the fourth day, and was pressed.

The wine was somewhat slow in clearing, and a nearly insensible fermentation continued for about a month. At the end of a month it was clear, but tasted flat. At three months it was bright, full-bodied, and astringent, but somewhat flat and not quite clean-tasting. At six months it had been racked twice, and was bright, but heavy and coarse.

No. 2063. *St. Macaire*, from Mission San José. Received November 1, 1893, in good condition. The bunches were of medium size, loose, irregularly conical, winged; the berries of medium size. The grapes were mature, and the must showed 24.8% of solid contents by spindle. The temperature of the grapes at crushing was 61°, and the maximum reached was 81°, on the fourth day. On the fifth day the murk was dry, and was pressed out.

At one month the wine was clear, and at three months bright, very rough, and full-bodied. At seven months it did not show very high quality, but was sound and very rich in color.

No. 2116. *St. Macaire*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received November 6, 1893, in good condition. The bunches were over medium in size, loose, irregular, branching; the berries of medium size, round, soft, thick-skinned, very ripe, but with good acid. The must showed 25.9% of solid contents by spindle.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF BORDEAUX TYPE.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
	Cabernet Sauvignon.										
1248	Fresno	1890	22.40	21.80	.65	.32					
1662	Amador station	1892	22.95		.57						
1820	Amador station	1893	22.70		.80	.21					
2282	Amador station	1894	25.45	23.61	.53						
1342	Mission San José	1890	22.90		.62	.26	11.36	.252		.40	2.78
1591	Mission San José	1891	25.40	24.11	.44						
1765	Mission San José	1892	21.95	21.22	.77		10.83	.199	.69	.63	2.85
1950	Mission San José	1893	22.10		.58						
2303	Mission San José	1894	29.00		.47						
1347	Cupertino	1890	24.80		.40						
1554	Paso Robles	1891	25.65		.41						
1750	Paso Robles	1892	24.80		.31						
1914	Paso Robles	1893	24.80	25.19	.53	.23	11.61			.46	3.10
1892	Tulare	1893	23.70	20.99	.37						
2207	Tulare	1894	25.50	24.12	.39						
	Average, Amador station		**23.70**	**23.61**	**.63**	**.21**					
	Average, Mission San Jose		**24.27**	**22.67**	**.57**	**.26**	**11.09**	**.225**	**.69**	**.52**	**2.82**
	Average, Paso Robles			**25.19**	**.42**	**.23**	**11.64**			**.46**	**3.10**
	Average, Tulare		**24.60**	**22.56**	**.38**						
	Cabernet Franc.										
1522	Mission San José	1891	26.95	26.31	.44						
2294	Mission San José	1894	23.20		.36						
1559	Paso Robles	1891	23.50		.58						
1762	Paso Robles	1892	22.85		.50						
2070	Paso Robles	1893	26.70	25.76	.43	.30	12.36	.262	.49	.36	3.15
	Average, Mission San Jose			**26.31**	**.40**						
	Average, Paso Robles			**25.76**	**.50**	**.30**	**12.36**	**.262**	**.49**	**.36**	**3.15**

	Merlot.										
1218	Fresno	1890	23.70		.28						
1366	Cupertino	1890	26.30		.38						
2060	Cupertino	1893	26.30		.51			.294	.74		
1380	Mission San José	1890	28.80		.40						
1586	Mission San José	1891	25.90	24.96	.36	.44					
1993	Mission San José	1893	25.90		.58			.451	.68		
2259	Mission San José	1894	23.70		.49						
1955	Paso Robles	1893	28.40	28.33	.29	.33		.326	.41		
	Average, Cupertino		**26.30**		**.44**			**.294**	**.74**		
	Average, Mission San Jose		**26.07**	**24.96**	**.46**	**.44**		**.451**	**.68**		
	Malbeck.										
1303	Mission San José	1890	24.55		.56	.38					
2274	Mission San José	1894	22.60		.50						
1321	Cupertino	1890	25.20		.53						
2055	Cupertino	1893	25.20		.62			.384	.90		
1475	Fresno	1891	25.00	24.64	.55	.51					
1489	Paso Robles	1891	28.80	29.07	.54						
1653	Paso Robles	1892	22.15	21.80	.53	.34					
1917	Paso Robles	1893	26.30	24.64	.50	.38	12.20	.272	.48	.44	3.30
1665	Amador station	1892	24.25		.58						
1817	Amador station	1893	21.50	20.99	.78	.26		.294	.72		
1679	Tulare	1892	22.80		.44						
1797	Tulare	1893	21.10	18.90	.62	.45	9.27	.298	.51	.67	3.80
2208	Tulare	1894	22.60		.53						
	Average, Mission San Jose		**23.58**		**.53**	**.38**					
	Average, Cupertino		**25.13**	**24.64**	**.57**	**.51**		**.384**	**.90**		
	Average, Paso Robles		**25.75**	**25.12**	**.52**	**.36**	**12.20**	**.272**	**.48**	**.44**	**3.30**
	Average, Amador station		**22.88**	**20.99**	**.68**	**.26**		**.294**	**.72**		
	Average, Tulare		**22.13**	**18.90**	**.53**	**.45**	**9.27**	**.298**	**.51**	**.67**	**3.80**
	Verdot.										
1223	Fresno	1890	23.70	23.62	.57	.33					
1250	Fresno	1890	24.10	23.62	.57	.27					
1331	Cupertino	1890	21.05		.92						
2043	Cupertino	1893	25.70		1.10			.355	.94		
2115	Cupertino	1893	26.30		1.15			.400	.79		
2124	Cupertino	1893	25.70		1.01						
1382	Mission San José	1890	25.00		.99	.23	12.36	.320		.39	3.32
1592	Mission San José	1891		24.11	.82	.40	11.91	.291	.67	.49	3.20
1991	Mission San José	1893	24.10		.92			.425	.85		
2306	Mission San José	1894	25.00		.64						
1551	Paso Robles	1891	23.40		.39						

SUMMARY OF ANALYSES OF MUSTS AND WINES OF BORDEAUX TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid (as Tartaric)	WINE. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
	Verdot—Continued.										
1726	Paso Robles	1892	25.90	.....	.48	.....	.....	.....	.....	.....	.....
1736	Paso Robles	1892	20.60	.....	.53	.....	.....	.....	.....	.....	.....
1935	Paso Robles	1893	26.95	26.24	.49	.31	.....	.534	.41	.....	.....
1681	Tulare	1892	23.70	.....	.39	.....	.....	.....	.....	.....	.....
1942	Tulare	1893	22.35	21.38	.63	.23	.....	.438	.56	.....	.....
2317	Tulare	1894	26.00	.....	.47	.....	.....	.....	.....	.....	.....
1828	Amador station	1893	21.50	.....	1.23	.....	.....	.386	1.13	.....	.....
	Average, Fresno	.....	**23.90**	**23.62**	**.57**	**.30**	.....	.....	.....	.....	.....
	Average, Cupertino	.....	**24.69**	.....	**1.04**	.....	.....	**.377**	**.86**	.....	.....
	Average, Mission San Jose	.....	**24.52**	.....	**.84**	**.32**	**12.13**	**.345**	**.76**	**.44**	**3.26**
	Average, Paso Robles	.....	.....	**26.24**	**.47**	**.31**	.....	**.534**	**.41**	.....	.....
	Average, Tulare	.....	**24.02**	**21.38**	**.49**	**.23**	.....	**.438**	**.56**	.....	.....
	Gamai Teinturier.										
1228	Fresno	1890	25.40	25.76	.64	.40	.....	.....	.....	.....	.....
1276	Cupertino	1890	21.93	.....	.80	.23	11.45	.202	.84	.52	2.58
2128	Cupertino	1893	26.50	.....	.68	.....	.....	.349	.71	.....	.....
1580	Mission San José	1891	26.80	26.99	.65	.....	13.73	.307	.75	.50	2.70
1684	Mission San José	1892	24.10	.....	.93	.....	11.82	.232	.84	.86	3.10
1945	Mission San José	1893	23.20	.....	.87	.....	.....	.428	.86	.....	.....
2265	Mission San José	1894	25.65	.....	.80	.....	.....	.....	.....	.....	.....
1663	Amador station	1892	25.86	.....	.58	.....	.....	.....	.....	.....	.....
1823	Amador station	1893	20.20	.....	.88	.....	.....	.253	1.00	.....	.....
1866	Paso Robles	1893	23.05	20.99	.68	.24	10.58	.122	.56	.55	2.95
1893	Tulare	1893	26.90	24.12	.64	.40	.....	.317	.71	.....	.....
	Average, Cupertino	.....	**24.22**	.....	**.74**	**.23**	**11.45**	**.275**	**.78**	**.52**	**2.58**
	Average, Mission San Jose	.....	.....	**26.99**	**.81**	.....	**12.78**	**.322**	**.82**	**.68**	**2.90**
	Average, Amador station	.....	**23.03**	.....	**.73**	.....	.....	**.253**	**1.00**	.....	.....

	Teinturier.										
1205	Fresno	1890	24.55	24.43	.48	.54	11.64	.210	.46	.38	3.20
1235	Fresno	1890	22.00	21.80	.71	.43					
1283	Cupertino	1890	25.20		.70	.32	12.36	.359	.54	.32	3.28
2121	Cupertino	1893	26.10		.50			.531			
1292	Mission San José	1890	23.60		.80	.21	11.64	.310	.71	.37	2.78
1521	Mission San José	1891	25.90	25.19	.60		12.13	.311	.74	.59	3.05
1587	Mission San José	1891	27.55	26.99	.55						
1710	Mission San José	1892	25.00		.70	.32					
1946	Mission San José	1893	25.90		.85			.547	.83		
2271	Mission San José	1894	22.70		.53			.305			
1497	Paso Robles	1891	21.50	20.99	.57	.33	10.00	.100	.53	.53	3.05
1666	Amador station	1892	26.25		.56						
1831	Amador station	1893	23.70		.60			.361	.75		
2196	Amador station	1894	28.00		.33						
1943	Tulare	1893	23.45		.74						
2151	Tulare	1894	24.55		.57						
	Average, Fresno		**23.27**	**23.11**	**.59**	**.48**	**11.64**	**.210**	**.46**	**.38**	**3.20**
	Average, Cupertino		**25.65**		**.60**	**.32**	**12.36**	**.445**	**.54**	**.32**	**3.28**
	Average, Mission San Jose			**26.08**	**.67**	**.26**	**11.93**	**.310**	**.72**	**.48**	**2.91**
	Average, Amador station		**25.98**		**.49**			**.361**	**.75**		
	Average, Tulare		**24.00**		**.65**						
	Charbono.										
1536	Paso Robles	1891	24.15		.34						
1730	Paso Robles	1892	20.00		.51						
1934	Paso Robles	1893	23.10	21.63	.48	.34	10.58	.218	.45	.41	3.10
1623	Tulare	1892	24.15		.44						
1844	Tulare	1893	20.85	18.84	.49	.48	9.54	.141		.49	3.20
2212	Tulare	1894	24.40		.41						
1824	Amador station	1893	19.30		.74			.320	.80		
2283	Amador station	1894	24.80	24.12	.44						
	Average, Paso Robles		**22.42**	**21.63**	**.44**	**.34**	**10.58**	**.218**	**.45**	**.41**	**3.10**
	Average, Tulare		**23.13**	**18.84**	**.45**	**.48**	**9.54**	**.141**		**.49**	**3.20**
	Average, Amador station			**24.12**	**.59**			**.320**	**.80**		
	Tannat.										
1302	Mission San José	1890	27.20		.63	.28					
1523	Mission San José	1891	26.40		.61						
1686	Mission San José	1892	25.00		.72						
2079	Mission San José	1893	26.20		.57			.240	.66		
2261	Mission San José	1894	25.90		.56				.58		
1389	Cupertino	1890	25.00		.90						
2114	Cupertino	1893	32.20		.75			.611	.71		

SUMMARY OF ANALYSES OF MUSTS AND WINES OF BORDEAUX TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric.	WINE. Ash.	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
	Tannat—Continued.										
1560	Paso Robles	1891	23.25	.....	.62	.....	.....	.....	.63	.....	.....
1761	Paso Robles	1892	25.90	.....	.57	.....	.....	.....	.....	.....	.....
1911	Paso Robles	1893	25.70	25.19	.71	.29	12.00	.259	.65	.59	3.30
1661	Amador station	1892	24.85	.....	.72	.....	.....	.....	.....	.....	.....
1835	Amador station	1893	20.20	.....	1.24	.24	.....	.330	.88	.....	.....
2160	Amador station	1894	26.50	.....	.73	.....	.....	.....	.....	.....	.....
2322	Tulare	1894	27.20	.....	.37	.....	.....	.....	.....	.....	.....
	Average, Mission San Jose	.....	**26.14**	.....	**.62**	**.28**	.....	**.240**	**.62**	.....	.....
	Average, Cupertino	.....	**33.60**	.....	**.82**	.....	.....	**.611**	**.71**	.....	.....
	Average, Paso Robles	.....	.....	**25.19**	**.67**	**.29**	**12.00**	**.259**	**.64**	.....	**3.30**
	Average, Amador station	.....	**23.85**	.....	**.89**	**.24**	.....	**.330**	**.88**	.....	.....
	St. Macaire.										
1281	Cupertino	1890	19.90	.....	.99	.30	10.17	.294	.75	.53	3.08
2116	Cupertino	1893	25.90	.....	.66	.....	.....	.524	.77	.....	.....
1295	Mission San José	1890	21.95	.....	.95	.20	11.18	.225	.77	.51	2.82
1515	Mission San José	1891	22.15	21.96	1.07	.....	13.27	.301	.92	.50	2.60
1706	Mission San José	1892	20.00	19.54	1.07	.35	10.08	.309	.86	.79	3.20
2063	Mission San José	1893	24.80	24.34	.88	.32	11.91	.243	.80	.62	3.30
2272	Mission San José	1894	21.90	.....	.70	.....	.....	.....	.....	.....	.....
1443	Tulare	1891	22.40	.....	.50	.....	.....	.....	.....	.....	.....
1678	Tulare	1892	22.73	22.23	.38	.39	.....	.....	.....	.....	.....
1846	Tulare	1893	22.00	21.22	.74	.46	10.42	.259	65	.52	3.30
2205	Tulare	1894	24.80	.....	.52	.....	.....	.....	.....	.....	.....
1827	Amador station	1893	21.30	.....	1.05	.21	.....	.....	.....	.....	.....
2197	Amador station	1894	27.15	.....	.50	.....	.....	.....	.....	.....	.....
	Average, Cupertino	.....	**22.90**	.....	**.82**	**.30**	**10.17**	**.409**	**.76**	**.53**	**3.08**
	Average, Mission San Jose	.....	.....	**24.34**	**.79**	**.32**	**11.91**	**.243**	**.80**	**.62**	**3.30**
	Average, Tulare	.....	**22.98**	**21.72**	**.53**	**.43**	**10.42**	**.259**	**.65**	**.52**	**3.30**
	Average, Amador station	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

RED RHENISH TYPE.

The most noted of the German red wines, the wines of Ingelheim and Asmannshausen, are the product of the Blaue Burgunder or Pinot, which have been discussed under the Burgundy varieties. The light wines of Affenthal are made from the Affenthaler or Blaue Arbst, and resemble the wines of Bordeaux more than those of Burgundy. The grapes contain only a moderate amount of sugar, and full acid. The wine is light and of good color.

There are two varieties known in Germany under the name of Affenthaler. The one growing at the stations seems to be that which goes also under the name of Blaue Arbst, and is superior to the other in all but bearing qualities. It is very promising for California, and makes a wine of high quality, less rough and less marked in aroma than that of the best Medoc varieties, but of excellent character, and of good fermenting and keeping qualities.

AFFENTHALER.

(See Vit. Rept. 1887–89, p. 86.)

Further experiments with the Affenthaler show it to be one of the varieties capable of producing a red wine of high quality in California. The vine, though bearing some superficial resemblance to the Pinot, is certainly not identical with any variety of Pinot, as is stated by some ampelographers; and still less with Trollinger, as stated by others. The character of the wine allies it much more closely with the Bordeaux varieties than with the Burgundy. The variety, as it grows in California, does not correspond perfectly with the descriptions in European works, but differs only in particulars which may be due to elimatic causes. The following description is drawn from the vines growing in the Mission San José experimental plot: The leaves are of medium size, circular in outline, obtusely dentate with mucronate teeth alternately small and large; upper sinuses very shallow, lower none, petiolar sinus deep and narrow; the bunches are of medium size, conical, winged, well filled, but not compact; the berries are small, round, thin-skinned, juicy. At the Amador station the grapes have thicker skin, and at all the stations the leaves have much less indument than the European specimens are credited with.

The success of this variety at Fresno proves that the original habitat of a vine cannot always be taken as indicating infallibly the localities where it will be of use and where it will not. It did not bear heavily at Fresno, but it bore as well as any variety producing a wine of high quality. No. 1460, Affenthaler, from Fresno, was a wine of high body, astringency, and vinosity, with good flavor, color, and excellent keeping qualities. It was, perhaps, of higher quality than any wine made at this station from Fresno grapes. With 0.48% of acid the must averaged 24.80% of sugar, and fermented thoroughly and without difficulty. Unfortunately, the vine has not yet been tested at Tulare. At Mission San José and at Cupertino the Affenthaler has borne fairly well and has produced an excellent wine of good keeping qualities, slow to mature, less acid than the Italian varieties, but with greater delicacy. At Paso Robles the composition of the must has shown a slight deficiency in acid, and the vines have not borne well enough to allow of a wine-making test. At the Amador station the vine is a moderate grower and fair bearer, but has not yet been sufficiently tested.

Analyses of Musts and Wines.

	AFFENTHALER.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At Six Months	Body
1890	No. 1237. Fresno	Aug. 23	24.10	23.62	.48	.30						
	No. 1313. Cupertino	Oct. 8	21.50		.62	.25	8.84	11.00	.229	.55	.36	2.70
	No. 1417. Mission San José	Oct. 28	25.50		.72	.22	11.31	13.82	.313	.70	.48	3.08
1891	No. 1460. Fresno	Aug. 29	24.80		.48		9.70	12.09	.350	.54	.49	3.35
	No. 1541. Paso Robles	Oct. 6	25.00		.34							
	No. 1571. Mission San José	Oct. 7	21.95		.77					.68		
	No. 1583. Mission San José	Oct. 13	23.90	22.67	.63		9.56	11.91	.350	.68	.54	3.05
1892	No. 1646. Paso Robles	Sept. 13	22.60		.73							
	No. 1757. Paso Robles	Oct. 11	23.90		.42							
	No. 1793. Mission San José	Oct. 18	22.60		.72		9.05	11.27	.212		.72	2.65
1893	No. 1804. Amador station	Sept. 1	21.10		.93							
	No. 1885. Paso Robles	Sept. 21	22.20		.39							
	No. 1984. Mission San José	Oct. 19	24.80	23.91	.71		9.34	11.64	.290	.68	.66	3.10
	No. 2132. Cupertino	Nov. 1	26.30		.54				.365			
1894	No. 2147. Amador station	Sept. 13	26.50		.61							
	No. 2304. Mission San José	Oct. 12	22.80		.56				.183			

Color Readings.

	AFFENTHALER.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1891	No. 1460. Fresno	24.7 4VR	22.2 5VR	12.4 1–2R	11.4 1R	14.3 R	12.3 1R
	No. 1571. Mission San José	93.0 VR	27.0 2VR	16.5 4VR	16.5 5VR	11.2 R	
	No. 1583. Mission San José	108.0 VR 1VR	80.0 VR–1VR	66.6 1VR	40.0 1VR	40.8 1VR	
1893	No. 1984. Mission San José	86.9 VR	58.8 VR 1VR	50.6 1VR	46.0 1VR	36.0 2VR	29.8 3VR
	No. 2132. Cupertino	48.2 2VR					
1891	No. 2304. Mission San José	51.3 1 2VR					

RECORD OF TREATMENT.

No. 1237. *Affenthaler*, from Fresno. A sample for must analysis was received August 25, 1890, in good condition, and mature. The must showed 24.1 % of solid contents by spindle and 0.48 % of acid.

No. 1313. *Affenthaler*, from Cupertino. Received October 10, 1890, in good condition, and mature. The must showed 21.5 % of solid contents by spindle and 0.62 % of acid. The temperature of the 192 pounds crushed was 64°, and the maximum reached was 86°, on the fourth day. On the fifth day the wine was still a little sweet, and on the sixth day it was drawn off.

In three weeks the wine was clear, and showed high astringency. At six weeks an examination of the lees showed them to be sound, and the wine was bright, with some aroma and pleasant flavor, clean taste, and medium acid. At three months the lees were examined, and found to contain some *S. pastorianus* and a few acetic germs; the wine was bright, developing well, and was racked for the second time. At five and at six months the lees were examined again, and showed an increase of the *S. pastorianus* and still a little acetic taste; the wine was bright, with good flavor, and had developed a good bouquet, but was still rough. At eight months the lees showed no injurious ferments. At fifteen months the wine was bright, with good ruby color, rich bouquet and flavor, clean taste, and of high vinosity; it was a wine of high quality, and was mature. Two months later it was racked, and part put in bottle. The rest was bottled at twenty-three months. At three years and three months the wine bottled at seventeen months was bright, in first-class order, and of high quality; the wine bottled later had not kept so well.

No. 1417. *Affenthaler*, from Mission San José. Received October 30, 1890, in fair condition, and mature. The must showed 25.5 % of solid contents by spindle and 0.72 % of acid. The grapes (116 pounds) were crushed the day after arrival, at a temperature of 66°; reached a maximum of 87° on the third day. The wine was dry on the sixth day, when it was drawn off.

At one month the wine was clear, showed good flavor and aroma, medium acid, high astringency, was of good quality, and still slightly sweet. At three months a microscopical examination of the lees showed them to be sound, and the wine was racked for the second time. The wine was clear, with good bouquet and flavor—a very agreeable wine, but with a trace of sugar. At five months the lees showed a few filaments, and the wine was pasteurized. It was bright, but still a little sweet, and the taste was slightly affected by secondary fermentation. At eight months it was racked for the third time, and at twelve months had lost all its sweetness; it was clear, and still showed good quality, but it had deteriorated. It was bottled, but did not keep well in bottle.

No. 1460. *Affenthaler*, from Fresno. Received August 31, 1891, in good condition. The must showed 24.8 % of solid contents by spindle and 0.48 % of acid. The grapes weighed 50.25 pounds, and were crushed on the day they were received. The temperature of the must at crushing was 66° and the maximum of 83° was reached on the fifth day. The wine was still a little sweet on the eighth day, when it was drawn off.

At three weeks the wine was very rough and astringent, cloudy, but quite dry. At six weeks it was bright, with good aroma and full and pleasing flavor. At two months it was racked. At four months it was bright, a very good wine, much softened down, and nearly mature (there were only two gallons). Tastings at six and at eight months showed that the wine retained its good quality, and had improved. At eight months it was put in glass. At three years and a half it was bright, with well-settled deposit, lacking in bouquet, but of very good flavor, smooth, clean-tasting, and of good and sufficient color.

No. 1541. *Affenthaler*, from Paso Robles station. A sample for must analysis was received October 8, 1891, in fair condition. The grapes were thin-skinned, somewhat crushed, and mature. The must showed 25.0 % of solid contents by spindle and 0.34 % of acid.

No. 1571. *Affenthaler*, from Mission San José. A sample for must analysis and color test was received October 9, 1891, in good condition. The must showed 21.95 % of solid contents by spindle and 0.77 % of acid.

No. 1583. *Affenthaler*, from Mission San José. Received October 16, 1891, in fair condition. The must showed 23.9 % of solid contents by spindle, and 0.63 % of acid. There were 159 pounds, which were crushed at a temperature of 70°. The maximum temperature, reached on the third day, was 91°. On the fourth day the wine was dry, and was drawn off.

At one month the wine was clear, very rough, and showed some aroma. At five months it was bright, an excellent, very solid wine, but with little bouquet. At ten months it was racked for the third time. The lees were examined at one, four, and five months, but no unsound ferments were found. At sixteen months the wine was in good order, had developed some bouquet, was of good quality, but slightly bitter. At eighteen months it was racked, and part bottled; at twenty-two months the rest was bottled. At two years and four months the bottled wine was tasted; both bottlings were bright and of good color; that last bottled had been injured by remaining too long in a small keg; the second bottling was a full, generous wine, with some bouquet and of full flavor, but too rough and not aged enough in wood.

No. 1646. *Affenthaler*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 22.6 of solid contents by spindle and 0.73 of acid.

No. 1757. *Affenthaler*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 23.9 of solid contents by spindle and 0.43 of acid.

No. 1793. *Affenthaler*, from Mission San José. Received October 21, 1892, in poor condition. The must showed 22.6 of solid contents by spindle and 0.72 of acid. The 131.5 pounds were crushed at a temperature of 63°, and reached a maximum of 87° on the third day. The wine was nearly dry on the fourth day, and was drawn off on the fifth.

In one month the wine was clear, and was racked and taken to the cellar. At three months it was bright, clean-tasting, with high acid and astringency, some bouquet and flavor; in general, a very agreeable wine. At five months it was in good order, faintly sweet, but sound. It was racked for the second time, and at eight months was quite dry, but still raw. At ten months it was still very rough and astringent, but promising. Four months later it had improved, but was not mature. At eighteen months it was bottled.

No. 1804. *Affenthaler*, from Amador station. A sample for must analysis was received September 1, 1893, in good condition. The bunches were of medium size, compact; the berries small and thick-skinned. The must showed 21.1 of solid contents by spindle and 0.93 of acid.

No. 1885. *Affenthaler*, from Paso Robles station. A sample for must analysis was received September 21, 1893, in good condition. The bunches were small and loose; the berries soft, thin-skinned, with some flavor, and mature. The must showed 22.2 of solid contents by spindle and 0.39 of acid.

No. 1984. *Affenthaler*, from Mission San José. Received October 19, 1893, in good condition. The bunches were of medium size, conical, winged, well filled, but not compacted; the berries were small, round, thin-skinned, juicy, mature. The must showed 24.8 of solid contents by spindle and 0.71 of acid. The 115 pounds were crushed at a temperature of 60°, and attained a maximum of 88° on the third day. The wine was dry on the fifth day, and was drawn off on the sixth.

At one month the wine was clear, but extremely rough. It was racked and taken to the cellar, and at three months was bright, with very marked acid and astringency, full and agreeable bouquet and flavor, a wine of good promise. At four months it was racked for the second time, and at seven months it had improved, but was still very rough and showed excellent keeping qualities. At ten months the lees showed *S. pastorianus;* the wine was in good order, but still very rough. A month later it was racked and in part bottled. At sixteen months the wine was in good order, improved in bouquet and flavor, of clean taste, a full, rich wine, but not quite mature. A month later it was bottled.

No. 2132. *Affenthaler*, from Cupertino. A sample for must analysis was received November 3, 1893, in good condition. The bunches were small, conico-cylindrical, compact; the berries were small, shriveled, much overripe, but with a fresh taste. The must showed 26.3 of solid contents by spindle and 0.54 of acid.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF RED RHENISH TYPE.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	Body
	Affenthaler.										
1237	Fresno	1890	24.10	23.62	.48	.30					
1460	Fresno	1891	24.80		.48		12.09	.350	.54	.49	3.35
1313	Cupertino	1890	21.50		.62	.25	11.00	.229	.55	.36	2.70
2132	Cupertino	1893	26.30		.54			.365			
1417	Mission San José	1890	25.50		.72	.22	13.82	.313	.70	.48	3.08
1571	Mission San José	1891	21.95		.77				.68		
1583	Mission San José	1891	23.90	22.67	.63		11.91	.350	.68	.54	3.05
1793	Mission San José	1892	22.60		.72		11.27	.212		.72	2.65
1984	Mission San José	1893	24.80	23.91	.71		11.64	.290	.68	.66	3.10
2304	Mission San José	1894	22.80		.56			.183			
1541	Paso Robles	1891	25.00		.34						
1646	Paso Robles	1892	22.60		.73						
1757	Paso Robles	1892	23.90		.42						
1885	Paso Robles	1893	22.20		.39						
1804	Amador station	1893	21.10		.93						
2147	Amador station	1894	26.50		.61						
	Average, Fresno		**24.45**	**23.62**	**.48**	**.30**	**12.09**	**.350**	**.54**	**.49**	**3.35**
	Average, Cupertino		**23.90**		**.58**	**.25**	**11.00**	**.297**	**.55**	**.36**	**2.70**
	Average, Mission San Jose		**24.25**	**23.29**	**.63**	**.22**	**12.16**	**.269**	**.68**	**.60**	**2.97**
	Average, Paso Robles		**23.42**		**.47**						
	Average, Amador station		**23.85**		**.77**						

RED BURGUNDY TYPE.

(For further description, see Vit. Rept. 1887-89, p. 89.)

Notwithstanding the general failure of the Burgundy grapes proper (the Pinots) in California, there are some very good as well as some very bad wines which are sold here under the name of Burgundies. They have, however, very seldom much resemblance to the Burgundies of France, and in fact differ so much among themselves that there is not even a type of wine which could be called California Burgundy. The reason for the repeated failures to make and keep good Pinot wines is doubtless to be looked for in the lack of proper methods and care in fermentation. The Bordeaux and Italian varieties have given universally so much better results than those of Burgundy that the latter are being almost entirely abandoned; but with proper control of temperature, and exclusion of injurious germs during fermentation and the first months of keeping, we shall doubtless be able to make as good or better wines of the more delicate Pinots. It is very much to be desired that this should be done, for the American and English taste prefers, in general, the smooth Burgúndy type to the somewhat harsher Clarets.

PINOTS.

(See Vit. Rept. 1885-86, p. 77; 1887-89, p. 90.)

The latest investigations of this group of grapes confirm the opinions expressed in the last Viticultural Report. Under the conditions of wine-making in California, it is next to impossible to make and keep a perfectly sound wine of Pinots alone. In some localities it is doubtless possible to make a Pinot wine of high quality and to age it, but only with a minute attention to detail and an elaborate care, which no price that is likely to be obtained at present would justify. The grapes would have to be picked at exactly the right degree of ripeness, handled with the greatest care to avoid breaking the berries, and then fermented and kept in a perfect cellar, where the conditions of temperature, ventilation, and cleanliness were under perfect control.

Nearly all the Pinot wines made at the experimental cellar have been injured by secondary fermentations, principally on account of the poor condition in which the grapes have been received, it being almost impossible to ship such delicate grapes without crushing them and allowing them to become attacked by injurious organisms, before they can be put into the fermenting-vat. For the hot interior localities the Pinots must be unhesitatingly rejected. In the cooler localities of the Coast Range they may be utilized by blending in the fermenting-vat with some more acid and more robust variety, such as the Gamai Teinturier, but with some sacrifice of their smooth Burgundy character. Their juice has entered into the composition of some of the best champagne wines made in this State.

PINOTS.	Varieties.	Date of Picking.	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric.	MUST. Ash	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing.	WINE. Total Acid as Tartaric. At Six Months.	WINE. Body
1890—No. 1219. Fresno	Blauer Burgunder	Aug. 22	21.50	21.38	.69	.39						
No. 1224. Fresno	Pinot de St. George	Aug. 22	25.00	25.19	.62	.55						
No. 1232. Fresno	Blauer Burgunder	Aug. 23	25.40	24.64	.42	.38						
No. 1258. Mission San José	Pinot (mixed)	Sept. 24	24.80	.....	.65	.31	9.92	12.36	.102	.54	.38	3.10
No. 1325. Cupertino	Franc Pinot	Oct. 11	26.30	.....	.54							
No. 1332. Cupertino	Pinot de St. George	Oct. 11	25.75	.....	.81							
No. 1374. Cupertino	P. Noirien	Oct. 14	27.80	.....	.57							
No. 1392. Cupertino	Blauer Burgunder	Oct. 19	29.70	.....	.34							
1891—No. 1437. Tulare	Blauer Burgunder	Aug. 24	23.60	.....	.39							
No. 1484. Paso Robles	Pinot de St. George	Sept. 1	19.70	.....	.54							
No. 1506. Mission San José	Franc Pinot	Sept. 27	25.00	24.64	.61							
No. 1508. Mission San José	Pinot de St. George	Sept. 27	25 00	24.64	.53	.39						
No. 1588. Mission San José	Blauer Burgunder	Oct. 14	28.00	28.32	.54							
1892—No. 1624. Tulare	Pinot de St. George	Aug. 29	22.15	.....	.37							
No. 1638. Mission San José	"Pinots"	Sept. 10	22.70	.....	.75		9.20	11.45	.189	.64	.63	2.70
No. 1744. Paso Robles	Pinot de St. George	Oct. 11	21.10	.....	.34							
1893—No. 1809. Amador station	Franc Pinot	Sept. 1	23.30	.....	.56				.230	.53		
No. 1819. Amador station		Sept. 6	22.80	22.33	.53		9.05	11.27	.189	.49	.86	3.30
No. 1910. Paso Robles	Pinot de St. George	Oct. 5	23.50	23.71	.41		7.99	10.00	.138	.44	.35	2.40
No. 2005. Tulare	Pinot de St. George	Oct. 23	23.10	21.80	.32							
No. 2064. Mission San José	Pinot de St. George	Nov. 2	28.60	27.65	.47				.262			
No. 2077. Mission San José	Franc Pinot	Nov. 3	28.30	26.99	.48		10.81	13.27	.150	.61	.50	3.20
1894—No 2263. Mission San José	Pinot de St. George	Oct. 5	22.20	.....	.74				.173			
Pinot de Pernand.												
1890—No. 1226. Fresno		Aug. 23	24.55	24.22	.54	.46						
No. 1367. Cupertino		Oct. 14	25.90	.....	.75							
1891—No. 1480. Paso Robles		Sept. 1	21.30	17.70	.48							
No. 1504. Mission San José		Sept. 24	24.55	23.62	.53	.32	9.63	12.09	.210	.50	.44	3.34
1892—No. 1702. Tulare		Sept. 27	26.90	.....	.39							
1893—No. 1799. Tulare		Aug. 31	23.30	.....	.67							

Analyses of Musts and Wines—Continued.

	PINOTS.	Varieties.	Date of Picking.	MUST. Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	WINE. Alcohol. By Weight.	Alcohol. By Volume.	Tannin.	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At Six Months.	Body.
	Pinot de Pernand—Continued.												
1893	No. 1867.	Paso Robles	Sept. 15	22.60	20.61	.47	.31	.....	.....	.102	.....	.....	.....
1894	No. 2152.	Tulare	Sept. 17	22.60	.....	.57	.....	.....	.....	.....	.....	.....	.....
	No. 2270.	Mission San José	Oct. 5	25.20	.....	.46	.....	.....	.....	.175	.....	.....	.....

Color Readings.

	PINOTS.		At Pressing.		One Month.		Two Months.		Three Months.		Four Months.		Five Months.		Six Months.	
1892	No. 1638.	Mission San José	48.8	2VR	28.4	5VR	21.7	R	17.4	1R	17.6	1R	15.8	R	14.2	1R
1893	No. 1809.	Amador station	9.0	3R+Y	9.7	R+Y	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	No. 1819.	Amador station	12.9	3VR+Y	16.3	VR+Y	12.1	(Y)	12.1	(Y)	.....	.....	.....	.....	.....	.....
	No. 1910.	Paso Robles	38.0	VR	9.6	R	9.3	R	8.3	R	3.8	3R+Y	.....	.....	.....	.....
	No. 2064.	Mission San José	35.7	5VR	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	No. 2077.	Mission San José	26.3	4VR	18.1	R	15.0	R	13.3	R	5.9	Y	.....	.....	.....	.....
1894	No. 2263.	Mission San José	19.1	1R	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Pinot de Pernand.															
1891	No. 1504.	Mission San José	37.0	5VR	19.2	5VR	14.1	1R	14.0	1R	14.6	3R	.....	.....	.....	.....
1893	No. 1867.	Paso Robles	12.4	1R	10.3	3R	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	No. 2270.	Mission San José	52.0	1VR	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1219. *Blauer Burgunder*, from Fresno. A sample for must analysis was received August 25, 1890, in poor condition—crushed, overripe, and some of the berries dried. The must showed 21.5 % of solid contents by spindle and 0.69 % of acid.

No. 1224. *Pinot St. George*, from Fresno. A sample for must analysis was received August 25, 1890, in good condition, but overripe. The must showed 25.0 % of solid contents by spindle and 0.62 % of acid.

No. 1232. *Blauer Burgunder*, from Fresno. A sample for must analysis was received August 25, 1890, in good condition, but overripe, and with some dried berries. The must showed 25.4 % of solid contents by spindle and 0.42 % of acid.

No. 1258. *Pinots* (mixed), from Mission San José. Received September 26, 1890, in fair condition, but somewhat bruised on account of loose packing. The grapes were very unevenly ripened; most of the bunches were mature, but some were unripe. The must showed 24.8 % of solid contents by spindle and 0.65 % of acid. The grapes, which consisted of Pinot de Pernand, Pinot St. George, and Pinot Noirien, were crushed on the day after arrival and fermented with some Meunier in the proportion of: Pinots, 250 lbs., and Meunier, 84.5 lbs. The temperature of the must was 67°, and the maximum reached was 97°, on the fourth day. On the fifth day the murk was nearly dry, and was drawn off.

The wine remained cloudy, and fermented slightly for a month, though at the end of that time no sugar was perceptible to the taste. At two months the lees were well settled, and a microscopic examination showed no unsound ferments. At this stage the wine was clear, but still giving off carbonic gas; it was of medium acid, low astringency, and good body, had a bitter after-taste, and was undeveloped and flat. A week later it was racked for the second time, and at four months it was still clear, but had a suspicious smell. An examination of the lees showed filaments, so the wine was pasteurized. Three months after pasteurizing it was bright, the unpleasant odor had almost disappeared, and the wine was light, smooth, and of fair quality. Two months later it was racked again, and at fifteen months it was bright, of poor color and bouquet, of fair flavor, and quite mature. Two months later it was racked and part put in glass. At twenty-five months the rest was bottled. Both samples deteriorated in the bottles, on account of secondary fermentations.

No. 1325. *Franc Pinot*, from Cupertino. A sample for must analysis was received October 13, 1890, in fair condition and quite mature. The must showed 26.3 % of solid contents by spindle and 0.54 % of acid.

No. 1332. *Pinot St. George*, from Cupertino. A sample for must analysis was received October 13, 1890, in good condition, but with some dried grapes. The must showed 25.75 % of solid contents by spindle and 0.81 % of acid.

No. 1374. *Pinot Noirien*, from Cupertino. A sample for must analysis was received October 17, 1890, in fair condition, a few berries moldy and some dried. The must showed 27.8 per cent of solid contents by spindle and 0.57 % of acid.

No. 1392. *Blauer Burgunder*, from Cupertino. A sample for must analysis was received October 21, 1890, in bad condition; some berries moldy, and many shriveled and overripe. The must showed 29.7 % of solid contents by spindle and 0.34 % of acid.

No. 1437. *Blauer Burgunder*, from Tulare station. A sample for must analysis was received August 27, 1891, in good condition. The must showed 23.6 % of solid contents by spindle and 0.39 % of acid.

No. 1484. *Pinot St. George*, from Paso Robles station. A sample for must analysis was received September 1, 1891, in good condition. The must showed 19.7 % of solid contents by spindle and 0.54 % of acid.

No. 1506. *Franc Pinot*, from Mission San José. Received September 27, 1891, in poor condition. The must showed 25.0 % of solid contents by spindle and 0.61 % of acid. The grapes were mixed with No. 1507, Meunier, and No. 1508, Pinot St. George, in the following proportions: Franc Pinot, 70 lbs.; Meunier, 59.5 lbs.; Pinot St. George, 45.25 lbs. The temperature of the grapes at crushing was 67°, and the maximum reached was 97°, on the third day. On the fourth day, when the murk was still a little sweet and fermenting slowly, it was drawn off.

At one month the wine was nearly clear, dry but flat, though somewhat better than the Pinot de Pernand. The lees were examined, and were apparently sound, but a month later the taste was a little suspicious and the wine was pasteurized for safety. It was then blended with No. 1504, Pinot de Pernand.

No. 1508. *Pinot St. George*, from Mission San José. Received September 27, 1891, in poor condition. The must showed 25.0 % of solid contents by spindle, and 0.53 % of acid. The grapes were mixed with No. 1506.

No. 1588. *Blauer Burgunder*, from Mission San José. A sample for must analysis was received October 16, 1891, in poor condition. The must showed 28.0 % of solid contents by spindle, and 0.54 % of acid.

No. 1624. *Pinot St. George*, from Tulare station. A sample for must analysis was received September 1, 1892, in good condition. The must showed 22.15 % of solid contents by spindle and 0.37% of acid.

No. 1638. *Pinots*, from Mission San José. Received September 13, 1892, in good condition, but not quite mature. The must showed 22.7% of solid contents by spindle, and 0.75% of acid. The weight of grapes crushed was 310 lbs. The temperature at crushing was 64°, and the maximum, reached on the third day, 94°. On the sixth day the wine was quite dry, and was drawn off.

At one month the wine was racked and taken to the cellar; it was dry and nearly clear. At four months it was bright, of good bouquet and flavor, fruity, clean-tasting, and sound. A little later the lees were examined and showed a little acetic taint, but no filaments. Two months later the wine was in good condition; it had kept well, and was a very good wine, with full and pleasing flavor and bouquet. At eight months it had been racked twice, and had changed little from the last tasting. After this it deteriorated, and at fifteen months was bright and of fair quality, had kept well for a Pinot, but was a little flat. At nineteen months it was bottled. At three years and a half the bottled wine was bright and showed good quality, but was not quite clean-tasting.

No. 1744. *Pinot St. George*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 21.1% of solid contents by spindle and 0.35% of acid.

No. 1809. *Franc Pinot*, from Amador station. A sample for must analysis was received September 1, 1893, in fair condition; the grapes were small and unevenly ripened, many of them were abortive and green. The must showed 23.3% of solid contents by spindle and 0.56% of acid.

No. 1819. *Pinot*, from Amador station. A sample for must analysis was received September 8, 1893, in good condition. The bunches were small, cylindrical, compact; the berries thin-skinned and juicy. This sample was labeled Serine, but by mistake, as it was evidently a Pinot. The must showed 22.8% of solid contents by spindle and 0.53% of acid.

No. 1910. *Pinot St. George*, from Paso Robles station. Received October 5, 1893, in good condition. There were some bunches of another variety mixed with the sample. The Pinot had small bunches of very ripe and somewhat shriveled berries, the other variety had larger, firmer, and unshriveled berries. The must showed 23.5% of solid contents by spindle and 0.41% of acid. Fifty-nine pounds of grapes were crushed at a temperature of 66°. The maximum temperature reached was 82°, on the second day. The wine was dry on the fourth day, when it was drawn off.

In three weeks the wine was racked and taken to the cellar; it was nearly clear, but tasted flat. At three months it was clear, smooth, and well flavored, but lacked freshness; at four months it was racked for the second time. At seven months it had changed little; it was a fair wine, but not quite clean-tasting. At ten months it had improved, and was bright and sound, but very light in color. A month later, the quantity being so small, it was bottled.

No. 2005. *Pinot St. George*, from Tulare Station. A sample for must analysis was received October 23, 1893, in good condition. Some other grape was mixed with the Pinot. The Pinot had small, well-filled bunches of small berries, overripe, but not shriveled. The must showed 23.1% of solid contents by spindle and 0.32% of acid.

No. 2064. *Pinot St. George*, from Mission San José. A sample for must analysis was received October 31, 1893, in good condition. The bunches were small, regular, close, cylindrical, with a small wing; the berries were small, shriveled, overripe. The must showed 28.6% of solid contents by spindle and 0.47% of acid.

No. 2077. *Franc Pinot*, from Mission San José. Received November 3, 1893, in good condition. The bunches were small, compact, cylindrical, with a small shoulder; the berries were small, soft, commencing to shrivel, and much overripe. The must showed 28.3% of solid contents by spindle and 0.48% of acid. There were 89.5 lbs. crushed at a temperature of 67°. The maximum, reached on the fourth day, was 85°. The wine was nearly dry on the sixth day, when it was drawn off.

At one month, when the wine was racked and taken to the cellar, it was clear, but very bitter. At two months it was clear and of good flavor, but still bitter. After this it improved, but did not quite lose its bitterness. At ten months the wine was bottled, on account of the smallness of the sample.

No. 1226. *Pinot de Pernand*, from Fresno. A sample for must analysis was received August 25, 1890, in good condition, but overripe. The must showed 24.55% of solid contents by spindle and 0.54% of acid.

No. 1367. *Pinot de Pernand*, from Cupertino. A sample for must analysis was received October 17, 1890, in fair condition, but somewhat overripe and shriveled. The must showed 25.9% of solid contents by spindle and 0.75% of acid.

No. 1480. *Pinot de Pernand*, from Paso Robles. A sample for must analysis was received September 3, 1891, in good condition. The bunches were small; the berries were very small, not very sweet, but matured. The must showed 21.3% of solid contents by spindle and 0.48% of acid.

No. 1504. *Pinot de Pernand*, from Mission San José. Received September 27, 1891, in fair condition; a little mold. The must showed 24.55% of solid contents by spindle and 0.53% of acid. There were 101 lbs. of grapes crushed at a temperature of 67°; and the

maximum temperature reached, on the third day, was 93°. On the fourth day the wine was still a little sweet and fermenting slowly, when it was drawn off.

At one month the wine was nearly clear, but tasted flat. At two months the lees showed a very few filaments and the wine tasted a little suspicious, so it was pasteurized and blended with No. 1506, Pinot from Mission San José. At six months the blend was clear, smooth, with some flavor and a little bouquet, low acid, medium astringency, fairly pleasing, but rather flat. It was racked for the third time, and again at eleven months. At seventeen months it showed improvement and had kept excellently. It was racked again at nineteen months and part bottled. At twenty-three months the rest was bottled. At three years and a half both wines were in first-class order, fresh and clean-tasting, and with excellent bouquet and full flavor. The earlier bottling was the better, was perfectly sound, and a wine of high character, the bouquet was remarkable, and the only fault it had was a slight greenness; the later bottling had a slight taint of acetic acid. Some of the wine bottled at eleven months had spoiled.

No. 1702. *Pinot de Pernand*, from Tulare station. A sample for must analysis was received September 29, 1892, overripe and badly shriveled. The must showed 26.9% of solid contents by spindle and 0.39% of acid.

No. 1799. *Pinot de Pernand*, from Tulare station. A sample for must analysis was received August 31, 1893, in good condition. The grapes were smaller than those of the average Pinot de Pernand, juicy, tasteless, the bunches well filled. The must showed 23.3% of solid contents by spindle and 0.67% of acid.

No. 1867. *Pinot de Pernand*, from Paso Robles station. A sample for must analysis was received September 15, 1893, in good condition. The grapes were mixed with a few bunches of Petit Sirah. The bunches were small, and the berries very sweet and overripe. The must showed 22.6% of solid contents by spindle and 0.57% of acid.

MEUNIER.

Synonyms: Müller traube; Miller grape.

Description.—More productive but less vigorous than the Franc Pinot; canes long, slender, trailing, often downy; young shoots very thickly covered with white down; leaves of medium size, round without sinuses, white downy on both sides, falling early; bunches small, close, short-cylindrical; berries small, round, on short pedicels, very juicy, and with rather thick skin.

The Meunier is simply one of the many variations of the ordinary Pinot. It is one of the most noticeable, on account of the abundance of white down with which it is covered. It bears rather better and is less liable to coulure and decay than the Franc Pinot, but otherwise the remarks under that variety apply equally to this.

ANALYSES OF MUSTS.

MEUNIER.	Date of Picking.	MUST.				Tannin.
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	
1890—No. 1212. Fresno	Aug. 22	24.10	23.61	.41	.20	.....
No. 1259. Mission San José	Sept. 24	24.60	.....	.57	.39	.....
No. 1280. Cupertino	Oct. 1	24.55	.....	.53	.53	.....
1891—No. 1507. Mission San José	Sept. 24	25.85	25.76	.52	.....	.....
No. 1558. Paso Robles	Oct. 4	22.15	.....	.66	.....	.....
1892—No. 1691. Tulare	Sept. 26	22.40	.....	.30	.....	.....
No. 1746. Paso Robles	Oct. 11	23.50	.....	.39	.....	.....
1893—No. 1808. Amador station	Sept. 1	23.70	.....	.51	.....	.....
No. 2057. Cupertino	Nov. 1	26.70	.....	.69	.....	.304
No. 2078. Mission San José	Nov. 4	28.00	.....	.45	.....	.329
1894—No. 2267. Mission San José	Oct. 5	28.00	.....	.45	.....	.....
No. 2309. Tulare	Oct. 10	23.70	.....	.38	.....	.....

COLOR READINGS.

MEUNIER.		At Pressing.	
1893—No. 2057.	Cupertino	40.0	2VR
No. 2078.	Mission San José	33.6	4VR

RECORD OF TREATMENT.

No. 1212. *Meunier*, from Fresno. A sample for must analysis was received August 25, 1890, in fair condition; overripe and somewhat dried. The must showed 24.1 % of solid contents by spindle and 0.41 % of acid.

No. 1259. *Meunier*, from Mission San José. Received September 26, 1890, in poor condition, mature. The must showed 24.6 % of solid contents by spindle and 0.57 % of acid. The grapes were fermented with No. 1258, Pinot from Mission San José.

No. 1280. *Meunier*, from Cupertino. A sample for must analysis was received October 2, 1890, in fair condition. The bunches were of fair size; the berries overripe and commencing to dry up. The must showed 24.55 % of solid contents by spindle and 0.53 % of acid.

No. 1507. *Meunier*, from Mission San José. Received September 27, 1891, in poor condition. The must showed 25.85 % of solid contents by spindle and 0.52 % of acid. The grapes were fermented with No. 1506, Franc Pinot.

No. 1558. *Meunier*, from Paso Robles. A sample for must analysis was received October 8, 1891, in good condition. The bunches were small and compact; the berries small and round and much firmer than is usual with Meunier. The grapes were mature, and the must showed 22.15 % of solid contents by spindle and 0.66 % of acid.

No. 1691. *Meunier*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 22.4 % of solid contents by spindle and 0.30 % of acid.

No. 1746. *Meunier*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 23.5 % of solid contents by spindle and 0.39 % of acid.

No. 1808. *Meunier*, from Amador station. A sample for must analysis was received September 1, 1893, in fair condition. The grapes were small and unevenly ripened. The must showed 23.7 % of solid contents by spindle and 0.51 % of acid.

No. 2057. *Meunier*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were under medium size, conico-cylindrical, close; the berries small, half-dried, over-mature. The must showed 26.7 % of solid contents by spindle and 0.69 % of acid.

No. 2078. *Meunier*, from Mission San José. A sample for must analysis was received November 3, 1893, in fair condition, much overripe, and the berries dried up. The must showed 28.0 % of solid contents by spindle and 0.45 % of acid.

ROBIN NOIR.

(See Vit. Rept. 1885–86, p. 69; 1887–89, p. 108.)

The results of the tests made of this variety at the newer stations are not such as to encourage its planting in the warmer sections of the State. At Tulare the must attains high sugar contents, but is lacking in acid, and the vines expend their strength principally on the second crop. At Paso Robles the vines bear better, but the wine is not of high quality and lacks tannin. At the Amador station the vine is a moderate grower and good bearer when pruned half-long, the grapes are well flavored and with fair color; they have not yet been tested as to their wine-making qualities, but they retain fair acid with a high percentage of sugar.

ANALYSES OF MUSTS AND WINES.

ROBIN NOIR.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1890—No. 1230. Fresno	Aug. 23	27.45	28.33	.43	.22	.....	.....	.....	.....	.....	.....
No. 1284. Cupertino	Oct. 1	21.50	.....	.81	.....	.....	.....	.....	.....	.....	.....
No. 1428. Mission San José	Oct. 28	24.45	.....	1.05	.....	.....	.....	.....	.....	.....	.....
1892—No. 1694. Tulare	Sept. 26	24.80	.....	.34	.....	.....	.....	.....	.....	.....	.....
No. 1792. Mission San José	Oct. 21	22.50	.....	.91	.....	.....	.....	.....	.....	.....	.....
1893—No. 1807. Amador station	Sept. 1	21.75	.....	.93	.....	.....	.....	.....	.....	.....	.....
No. 1953. Paso Robles	Oct. 15	23.70	22.23	.58	.30	9 70	12.09	.147	.60	.41	2.60
No. 1971. Tulare	Oct. 15	24.45	24.64	.45	.51	.....	.....	.....	.....	.....	.....
1894—No. 2199. Amador station	Sept. 25	28.40	.....	.48	.....	.....	.....	.....	.....	.....	.....
No. 2301. Mission San José	Oct. 12	22.10	.....	.71	.....	.....	.....	.....	.....	.....	.....
No. 2336. Tulare	Oct. 19	27.80	.....	.34	.....	.....	.....	.....	.....	.....	.....

COLOR READINGS.

ROBIN NOIR.	At Pressing.		One Month.		Two Months.		Three Months.	
1893—No. 1953. Paso Robles	12.1	1R	6.8	2R	8.9	3R	4.7	1VR+Y

RECORD OF TREATMENT.

No. 1230. *Robin noir*, from Fresno. A sample for must analysis was received August 25, 1890, in good condition, but somewhat dried and over-mature. The must showed 27.45% of solid contents by spindle and 0.43% of acid.

No. 1284. *Robin noir*, from Cupertino. A sample for must analysis was received October 3, 1890, in good condition. The must showed 21.5% of solid contents by spindle and 0.81% of acid.

No. 1428. *Robin noir*, from Mission San José. A sample for must analysis was received October 30, 1890, in fair condition and mature. The must showed 24.45% of solid contents by spindle and 1.05% of acid.

No. 1694. *Robin noir*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 24.8% of solid contents by spindle and 0.34% of acid.

No. 1792. *Robin noir*, from Mission San José. Received October 21, 1892, in poor condition. The must showed 22.5% of solid contents by spindle and 0.91% of acid. The grapes were crushed and fermented with No. 1791, Carignane, from Mission San José.

No. 1807. *Robin noir*, from Amador station. A sample for must analysis was received September 1, 1893, in good condition. The bunches were well filled, the berries small, hard, and tasteless. The must showed 21.75% of solid contents by spindle and 0.93% of acid.

No. 1953 *Robin noir*, from Paso Robles station. Received October 15, 1893, in fair condition. The bunches were of over medium size, irregularly conical, very compact, the lower ends turned to one side; the berries were of medium size, round, thick-skinned, juicy, fresh-tasting, but with little flavor, mature. The must showed 23.7% of solid contents by spindle and 0.58% of acid. The 107 lbs. crushed were started at a temperature of 64°, and reached a maximum of 85° on the third day. The wine was dry on the fourth day, and was drawn off on the fifth.

At one month the wine was nearly clear, very astringent, with little color and good flavor. At three months it was racked for the second time; it was clear, and showed good quality, but still retained a slight sweetness, and was not quite clean-tasting. It remained sub-sweet for some time, but finally became dry, and at ten months was of fair quality; it was racked for the third time, and part put in bottle. At sixteen months it was in good order, dry, with little color, somewhat "éventé." Three weeks later it was bottled.

No. 1971. *Robin noir*, from Tulare station. A sample for must analysis was received October 16, 1893, in good condition. The bunches were very small, conical, compact; the berries small, nearly round, very thick-skinned, soft, juicy, with full acid, but little color. The grapes had the appearance of second crop. The must showed 24.45% of solid contents by spindle and 0.45% of acid.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF BURGUNDY TYPE (RED).

Number	LOCALITY.	Vintage of	MUST.				WINE.				
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At 6 to 8 Months	Body
	Pinots.										
1219	Fresno	1890	21.50	21.38	.69	.39					
1224	Fresno	1890	25.00	25.19	.62	.55					
1232	Fresno	1890	25.40	24.64	.42	.36					
1258	Mission San José	1890	24.80		.65	.31					
1506	Mission San José	1891	25.00	24.64	.61						
1508	Mission San José	1891	25.00	24.64	.53	.39					
1588	Mission San José	1891	28.00	28.32	.54						
1638	Mission San José	1892	22.70		.75		11.45	.189	.64	.63	2.70
2064	Mission San José	1893	28.60	27.65	.47			.262			
2077	Mission San José	1893	28.30	26.99	.48		13.27	.150	.61	.50	3.20
2263	Mission San José	1894	22.20		.74			.173			
1325	Cupertino	1890	26.30		.54						
1332	Cupertino	1890	25.75		.81						
1374	Cupertino	1890	27.80		.57						
1392	Cupertino	1890	29.70		.34						
1437	Tulare	1891	23.60		.39						
1624	Tulare	1892	22.15		.37						
2005	Tulare	1893	23.10	21.80	.32						
1484	Paso Robles	1891	19.70		.54						
1744	Paso Robles	1892	21.10		.34						
1910	Paso Robles	1893	23.50	23.71	.41		10.00	.138	.44	.35	2.40
1809	Amador station	1893	23.30		.56			.230	.53		
1819	Amador station	1893	22.80	22.33	.53		11.27	.189	.49	.86	3.30
	Average, Fresno		**23.97**	**23.74**	**.58**	**.44**					
	Average, Mission San Jose		**25.57**	**26.45**	**.59**	**.35**					
	Average, Cupertino		**21.91**		**.45**						
	Average, Tulare		**22.95**	**21.80**	**.36**						
	Average, Paso Robles		**21.43**	**23.71**	**.43**		**10.00**	**.138**	**.44**	**.35**	**2.40**
	Average, Amador station		**23.05**	**22.33**	**.55**		**11.27**	**.109**	**.51**	**.86**	**3.30**

SUMMARY OF ANALYSES OF MUSTS AND WINES OF BURGUNDY TYPE (RED)—Continued.

Number	LOCALITY.	Vintage of	MUST. Solids Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
	Pinot de Pernand.										
1226	Fresno	1890	24.55	24.22	.54	.46					
1367	Cupertino	1890	25.90		.75						
1480	Paso Robles	1891	21.30	17.70	.48						
1867	Paso Robles	1893	22.60	20.61	.47	.31		.102			
1504	Mission San José	1891	24.55	23.62	.53	.32					
2270	Mission San José	1894	25.20		.46			.175			
1702	Tulare	1892	26.90		.39						
1799	Tulare	1893	23.30		.67						
2152	Tulare	1894	22.60		.57						
	Average, Paso Robles		**21.95**	**19.16**	**.48**	**.31**		**.102**			
	Average, Mission San Jose		**24.88**	**23.62**	**.49**	**.32**		**.175**			
	Average, Tulare		**24.27**		**.54**						
	Meunier.										
1212	Fresno	1890	24.10	23.61	.41	.20					
1259	Mission San José	1890	24.60		.57	.39					
1507	Mission San José	1891	25.85	25.76	.52						
2078	Mission San José	1893	28.00		.45			.329			
2267	Mission San José	1894	28.00		.45						
1280	Cupertino	1890	24.55		.53	.53					
2057	Cupertino	1893	26.70		.69			.304			
1558	Paso Robles	1891	22.15		.66						
1746	Paso Robles	1892	23.50		.39						
1691	Tulare	1892	22.40		.30						
2309	Tulare	1894	23.70		.38						
1808	Amador station	1893	23.70		.51						
	Average, Mission San Jose		**26.61**	**25.76**	**.49**	**.39**		**.329**			
	Average, Cupertino		**25.62**		**.61**	**.53**		**.304**			
	Average, Paso Robles		**22.88**		**.53**						
	Average, Tulare		**23.05**		**.34**						

	Robin noir.										
1230	Fresno	1890	27.45	28.33	.43	.22					
1284	Cupertino	1890	21.50		.81						
1428	Mission San José	1890	24.45		1.05						
1792	Mission San José	1892	22.50		.91						
2301	Mission San José	1894	22.10		.71						
1694	Tulare	1892	24.80		.34						
1971	Tulare	1893	24.45	24.64	.45	.51					
2336	Tulare	1894	27.80		.34						
1807	Amador station	1893	21.75		.93						
2199	Amador station	1894	28.40		.48						
1953	Paso Robles	1893	23.70	22.23	.58	.30	12.09	.147	.60	.41	2.60
	Average, Mission San Jose		**23.02**		**.89**						
	Average, Tulare		**25.68**	**24.64**	**.38**						
	Average, Amador station		**25.08**		**.70**						

JURA TYPE.

There is a class of full-bodied, deep-colored wines, of good and even high character, which are produced at various places in the region of the Rhone from the slopes of the Jura Mountains to the vineyards of the Hermitage. These wines differ markedly from the delicate Burgundies to the north, and equally from the neutral and rancio red wines to the south. They resemble to some extent the Medocs, but are heavier than the Clarets of commerce. They may be considered as holding an intermediate position between the Medoc wines and those of northern Italy. Wines made from Petite Sirah, Mondeuse, and César are of this type, and reach their highest development in the first growth of the Hermitage, made principally from Petite Sirah. The Beclan makes a wine of smoother and more neutral character, which is used to modify the occasionally excessive asperity of the above grapes. Though grown in connection with the grapes of this type, it has been placed among the Southern French, on account of the different character of its wine.

The *Petite Sirah* and *Mondeuse* are the varieties included in this type which have shown the highest quality in California. The former has been largely abandoned, on account of its poor bearing qualities; but the Mondeuse is deserving of a much more extended place in our vineyards than it has at present. It is a remarkably regular and fairly abundant bearer; it unites quality and abundance in as high a degree as perhaps any other red grape yet tried. It is especially adapted to the coast counties wherever the ripening is not too late.

One of the most valuable grapes of this category, though not properly belonging to the group, is the *Tinta Valdepeñas*. A really excellent wine has been made from it at Tulare; a somewhat surprising result, considering the climate and the nature of the soil where it was grown. For rich valley soils in the hotter districts probably no better choice could be made with the object of producing dry red wines. Some of the Italian varieties approach it in adaptability to these conditions, but none so far tried surpass it in the quality of their products.

SIRAH.

(See Vit. Rept. 1883–85, p. 101; 1885–86, p. 83; 1887–89, p. 177.)

But for its liability to coulure in certain localities, there would doubtless have been a much more extended planting of Petite Sirah than there has been. At Mission San José and in parts of Napa and Sonoma it has given excellent results. From Oakville and Mission San José it is reported as producing four tons per acre with short-pruning. In the Livermore Valley and in parts of Napa, it has been much less satisfactory, and no system of pruning seems to be capable of combating its tendency to drop its fruit. The remedy seems to be, as pointed out in the last report, to choose cuttings from fruitful vines only, as there seem to be forms or variations of the variety more subject to coulure than others. The form cultivated at the stations under the name of Serine sets its fruit and bears much better than the form cultivated under the name of Sirah.

At Tulare the vine has shown itself a good grower, with plenty of foliage, and bears from three to four tons per acre with long-pruning.

The wine produced there has some character, fair color, good body, and medium acid and astringency; it is not adapted to use alone, as it does not keep very well and drops its color. It is useful, however, to blend with an acid wine of less character and color.

The grapes received from Paso Robles in good condition have had an average composition of 24.4% of sugar and 0.55% of acid, and have given a wine of fair quality, good body and astringency, and good, stable color. At Amador station the vine grows fairly well and bears about two and a half tons per acre, but goes a good deal to second crop, and gives a must low in acid. The average composition of the must has been at Cupertino 26.2% of sugar and 0.52% of acid, and at Mission San José, where it has been most successful, 25.2% of sugar and 0.72% of acid. At the latter place it has made uniformly an excellent wine of full body and astringency, of good acid and quality; it is also an excellent keeper.

ANALYSES OF MUSTS AND WINES.

	SIRAH.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At six Months	Body
1890	No. 1242. Fresno	Aug. 1	25.10	24.11	.43	.37	9.92	12.36	.244	.30	.48	2.70
	No. 1278. Cupertino	Oct. 1	24.15		.67							
	No. 1296. Mission San José	Oct. 1	25.30		.84	.22	9.99	12.46	.259	.71	.45	3.45
	No. 1341. Mission San José	Oct. 11	25.40		.64	.19	10 54	13.00	.301	.44	.38	3.32
	No. 1370. Cupertino	Oct. 14	24.15		.52							
1891	No. 1438. Tulare	Aug. 24	25.65		.37							
	No. 1472. Fresno	Aug. 28	25.20		.48		9.92	12.36	.240	.51	.43	3.35
	No. 1488. Paso Robles	Sept. 12	23.70		.50							
	No. 1492. Paso Robles	Sept. 13	24.80		.53							
	No. 1564. Mission San José	Oct. 6	27.35		.65		12.39	15.20	.411	.71	.43	3.20
1892	No. 1616. Tulare	Aug. 26	23.70	22.23	.43	.30	8.48	10.58	.192	.32	.46	3.90
	No. 1635. Tulare	Sept. 4	25.10		.41							
	No. 1647. Paso Robles	Sept. 13	23.95		.69							
	No. 1664. Amador station	Sept. 16	26.40		.42							
	No. 1708. Mission San José	Oct. 3	23.25	23.13	.78	.35	9.27	11.55	.335	.83	.70	2.95
1893	No. 1814. Tulare	Sept. 1	22.40	21.80	.62	.50	8.27	10.36	.141	.47	.51	3.20
	No. 1879. Paso Robles	Sept. 15	22.60	20.99	.53	.43			.237	.46		
	No. 1895. Paso Robles	Sept. 28	25.85	25.53	.51	.37	9.92	12.36	.211	.51	.50	3.30
	No. 1952. Mission San José	Oct. 14	24.60		.94				.345	.77		
	No. 2044. Cupertino	Nov. 1	28.60		.58				.502			
	No. 2052. Cupertino	Oct. 31	28.20		.58				.553	.79		
	No. 2076. Mission San José	Nov. 3	28.80	25.65	.63	.30	10.91	13.36	.256	.65	.67	3.30
1894	No. 2139. Tulare	Sept. 10	21.50	20.83	.65		8.84	11.00	.159	.58	.44	2.85
	No. 2153. Tulare	Sept. 17	24.00		.53							
	No. 2254. Mission San José	Oct. 5	23.70		.64				.236			
	No. 2269. Mission San José	Oct. 5	23.70		.68				.245			
	No. 2286. Amador station	Oct. 6	23.50		.48							

COLOR READINGS.

SIRAH.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.	Six Months.
1890—No. 1341. Mission San José							
1891—No. 1472. Fresno	47.0 2VR	25.0 5VR	14.9 2VR+Y	15.2 1VR+Y	15.2 4VR+Y	13.8 1VR+Y	
No. 1564. Mission San José	149.0 VR	81.6 1VR	97.6 1-2VR	61.0 1-2VR	66.6 2VR		
1892—No. 1616. Tulare	16.0 R	11.4 1R	10.5 2R	10.7 3R	12.5 3R	11.4 3R	11.1 3R
No. 1708. Mission San José	285.0 VR	166.0 VR	103.0 2VR	80.0 2VR	74.2 2VR	70.2 2VR	
1893—No. 1814. Tulare	14.1 1VR+Y	8.5 2VR+Y	5.5 (Y)				
No. 1879. Paso Robles	66.6 VR	41.6 VR					
No. 1895. Paso Robles	70.2 VR	40.0 2VR	26.4 2VR	25.2 2VR	21.7 3VR	21.6 4VR	
No. 1952. Mission San José	143.0 VR						
No. 2044. Cupertino	114.0 VR						
No. 2052. Cupertino	103.0 1VR						
No. 2076. Mission San José	129.0 VR+1VR	103.0 1VR	90.9 2VR	85.1 2VR	40.8 3VR		
1894—No. 2139. Tulare	30.0 2VR	7.1 1R					
No. 2254. Mission San José	88.8 VR						
No. 2269. Mission San José	85.1 VR						

RECORD OF TREATMENT.

No. 1242. *Petite Sirah*, from Margherita Vineyard, Fresno. Received August 2, 1890, in fairly good condition. Berries somewhat small for the variety, maturity complete. The must showed 25.1% of solid contents by spindle. The temperature of the must at crushing was 67°, and the maximum reached was 91°, on the third day. The murk was still a little sweet on the fifth day, when it was drawn off.

The wine continued to ferment slowly, and remained cloudy for over six weeks after pressing. At nine weeks it was clear, without bouquet, with little flavor, full tannin, and medium acid. At this date it was pasteurized, as the lees showed some lactic germs, though the taste was as yet unaffected. At eight months the wine had been racked three times, and was bright, improved in flavor, had developed a little bouquet, but was still harsh. It continued to improve up to the age of about fourteen months, at which date it was nearly mature and quite sound. It was bottled at nineteen and twenty-four months. At a little over three years both wines were tasted, and that first bottled was found to be the better. Both wines were of fair quality, of good flavor and body, but without bouquet and not quite clean-tasting.

No. 1278. *Petite Sirah*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 2, 1890, in good condition. The bunches were loose and with many small berries. The must showed 24.15% of solid contents by spindle.

No. 1296. *Petite Sirah*, from Mission San José. Received October 3, 1890, in good condition. The berries were rather small and many of them abortive. The must showed 25.3% of solid contents by spindle. The temperature of the must was 68° at crushing, and the highest temperature reached was 89°, on the third day. The murk was nearly dry on the fourth day, and was drawn off on the fifth.

The wine was nearly clear within three weeks from pressing. At two months it was quite clear, with full and pleasing flavor, good acid and astringency, but aroma somewhat masked by a slight moldiness. At three months the lees showed a few lactic ferments, and the wine was pasteurized. At seven months it was bright and much improved, full flavored, and of good quality. It kept remarkably well, considering the small size of the sample, and at fourteen months was a wine of high quality, in excellent condition, and with good bouquet and rich flavor. At sixteen months it was bottled.

No. 1341. *Serine*, from Mission San José. Received October 14, 1890, in bad condition, many of the bunches moldy. The must showed 25.4% of solid contents by spindle. The temperature of the grapes at crushing was 67°, and the maximum reached was 92°, on the fourth day. The murk was nearly dry on the fifth day, and was drawn off on the sixth.

In three weeks the wine was clear, still a little sweet, and highly astringent. At three months it was bright, full flavored, with good body, high astringency and alcohol, medium acid, and in general a good wine. The lees showed a few lactic ferments, and the wine was pasteurized, though the taste was still unaffected. The wine remained a little flat for some time, but gradually improved up to the time it was bottled, at sixteen months. At three years the bottled wine was bright, highly flavored, full-bodied, and generally of high quality, but not quite clean-tasting.

No. 1370. *Serine*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 17, 1890, in good condition, but overripe. The must showed 24.15% of solid contents by spindle.

No. 1438. *Serine*, from Tulare. A sample for must analysis was received August 27, 1891, in good condition. The must showed 25.65% of solid contents by spindle.

No. 1472. *Serine*, from Margherita Vineyard, Fresno. Received August 31, 1891, in good condition. The must showed 25.2% of solid contents by spindle. The temperature of the must at crushing was 68°, and the maximum reached was 83°, on the third day. The murk was nearly dry on the seventh day, when it was drawn off.

The wine remained slightly sweet for two or three weeks after pressing, but at five weeks was clear and dry. At six weeks it was clear, full-bodied and well flavored, but with a suspicious taste. The lees showed a few lactic ferments, and the wine was pasteurized. At four months it had improved, had developed some bouquet, but still tasted a little flat. It was racked four times during the first year, and successive tastings showed a gradual improvement up to the time it was bottled at sixteen months, when it was bright, with some bouquet and flavor, sound and clean-tasting. At three years and a half the wine was bright, of fair color, good bouquet and flavor; a very agreeable wine of more character than the Mourastel, but not quite so clean-tasting.

No. 1492. *Petite Sirah*, from Paso Robles station. A sample for must analysis was received September 16, 1891, in good condition, small, and mature. The must showed 24.8% of solid contents by spindle.

No. 1564. *Serine*, from Mission San José. Received October 9, 1891, in fair condition. The must showed 27.35% of solid contents by spindle. The temperature of the must at crushing was 60° and the maximum reached was 87°, on the fourth day. The murk was nearly dry on the sixth day, and was drawn off on the seventh.

At six weeks the wine was clear, with some aroma and full flavor, medium acid, and

high astringency. At four months it was bright and of very good quality, showing no defect but a slight bitterness. At five months the wine was full-bodied and very good, with a slight sub-sweetness, but quite sound. It was racked three times during the first year, and remained in good order and developed well up to the time it was bottled at sixteen months.

No. 1616. *Serine*, from Tulare station. Received August 29, 1892, in good condition, and mature; there were a few small, abortive, green berries. The must showed 23.7% of solid contents by spindle. The temperature of the grapes at crushing was 65°, and the maximum reached was 96°, on the sixth day. The murk was not dry till the eighth day, when it was pressed.

This sample was fermented with No. 1617, Mondeuse, from Tulare, in the proportion of 72% of Serine to 28% of Mondeuse. In one month from pressing, the wine was clear, sound, and dry, but tasted a little flat. At four months it was bright, had good flavor, but the odor was not good, and the after-taste slightly bitter. The lees showed some filaments, so the wine was pasteurized. Two months after this the wine was racked; it had improved a little, but was not quite clean-tasting; its color was fairly good for a Tulare wine. It was bottled at nineteen months.

No. 1635. *Petite Sirah*, from Tulare station. A sample for must analysis was received September 6, 1892, in good condition. The must showed 25.1% of solid contents by spindle.

No. 1647. *Serine*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 23.95% of solid contents by spindle.

No. 1664. *Serine*, from Amador foothill station. A sample for must analysis was received September 19, 1892, in poor condition. The must showed 26.4% of solid contents by spindle.

No. 1708. *Serine*, from Mission San José. Received October 5, 1892, in fair condition. The must showed 23.25% of solid contents by spindle. The temperature of the grapes at crushing was 68°, and the maximum reached was 91°, on the third day. The murk was dry on the fourth day, and was drawn off on the fifth.

In three weeks the wine was clear and of good promise. At three months it was bright, of full, rich flavor, smooth, and of high quality. At five months it had improved, its acid and astringency being very marked. At this date it was racked for the second time. It remained bright and in good order, retaining its good quality till it was bottled at eighteen months.

No. 1814. *Serine*, from Tulare station. Received September 1, 1893, in fair condition, a few grapes moldy. The bunches were compact, the berries small and without flavor. The must showed 22.4% of solid contents by spindle. The temperature of the grapes at crushing was 65°, and the maximum reached was 92°, on the fifth day. The murk was dry on the fifth day, when it was drawn off.

In three weeks the wine was clear, and was racked and taken to the cellar. At five months it was clear and sound, but flat and of poor quality. At this date it was racked for the second time. At seven months it had improved somewhat, but was not fresh-tasting.

No. 1879. *Petite Sirah*, from Paso Robles station. Received September 15, 1893, in good condition. The bunches were loose and small, the berries small and well flavored, and mature. The must showed 22.6% of solid contents by spindle. The sample was used for must analysis and for color and tannin tests.

No. 1895. *Serine*, from Paso Robles station. Received September 28, 1893, somewhat crushed, but otherwise in good condition. The bunches were of good size, not compact; the berries of good size, well colored, and mature. The must showed 25.85% of solid contents by spindle. The temperature of the must was 66° at crushing; the maximum temperature reached was 87°, on the fourth day. The murk was dry on the sixth day, when it was drawn off.

The wine was somewhat slow in clearing, and was at first excessively rough. At two months it was nearly clear, highly flavored, and of full body. At four months it was clear, agreeably flavored, and smoother, but with a slightly bitter after-taste. At five months it was racked for the second time. At eight months it had improved, but was not quite clean-tasting.

No. 1952. *Petite Sirah*, from Mission San José. Received October 14, 1893, in poor condition, having been too long on the road. The bunches were of good size, irregular, well filled, but not compact. The grapes were well flavored, and the must showed 24.6% of solid contents by spindle. The sample was used for must analysis and for color and tannin tests.

No. 2044. *Petite Sirah*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received October 31, 1893, in good condition. The bunches were under medium size, conico-cylindrical, loose, much coulured; the berries were small, oval, much shriveled, overripe. The must showed 28.6% of solid contents by spindle.

No. 2052. *Serine*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received October 31, 1893, in good condition. The bunches were of medium size, long, conico-cylindrical, loose, but little coulured; the berries were small, commencing to shrivel, but with good acid. The must showed 28.2% of solid contents by spindle.

No. 2076. *Serine*, from Mission San José. Received November 3, 1893, in good condition. The bunches were under medium size, long, conico-cylindrical, with or without a small wing, loose; the berries were small, firm, but not crisp or pulpy, oval, very sweet, overripe. The must showed 28.8% of solid contents by spindle. The temperature of the grapes at crushing was 67°, and the maximum temperature reached was 87°, on the third day. The murk was still sweet on the sixth day, when it was drawn off.

In one month from crushing the wine was clear and dry. In two months it was bright, full-bodied, with dense color, full astringency, medium acid, and good flavor. At six months it was in excellent condition, still rough, but sound and with solid keeping qualities.

MONDEUSE.

(See Vit. Rept. 1883–85, p. 102; 1885–86, p. 83; 1887–89, p. 186.)

The latest experiments with the Mondeuse have confirmed the opinions expressed in former reports, and also the reputation the variety has in Europe, viz., that in suitable localities it will produce good crops, making full-bodied wines of good color, character, and keeping qualities, but in other localities its wine is thin and not of high quality. At the Mission San José station the vines have borne well, but the wine has been somewhat unsatisfactory, lacking in body and vinosity, though of good flavor. In the vineyard of Mr. McIver, of Mission San José, it has done better, but its best qualities are brought out in Napa and Sonoma, where it produces a wine of good body, color, and excellent keeping qualities. In Napa it is said to produce four to five tons to the acre with short-pruning; it also bears well in the Santa Clara Valley with short-pruning, but is occasionally subject to coulure.

At Tulare the vine is not a very strong grower, and though it sometimes bears good crops it is liable to coulure. The must is rather low in acid (average 22% of sugar and 0.42% of acid), but makes a good wine as regards tannin, color, and character. It makes a red wine of more vinosity and quality than perhaps any other grape at Tulare, but somewhat lacking in body. At the Amador station it has not borne well and has been subject to coulure. At Paso Robles it has succeeded better; but it has not yet been sufficiently tested there.

MONDEUSE.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1890—No. 1312. Cupertino	Oct. 6	20.40	.....	.79	.21	7.78	9.73	.237	.....	.45	2.70
No. 1334. Mission San José	Oct. 11	21.70	.....	.76	.21	8.84	11.00	.294	.58	.50	2.58
1891—No. 1563. Mission San José	Oct. 6	22.15	.....	.68	.....	8.91	11.09	.259	.77	.53	2.30
No. 1582. Mission San José	Oct. 13	22.60	22.22	.53	.....	9.20	11.45	.272	.68	.43	2.70
No. 1595. Kenwood, Sonoma County	Oct. 16	23.70	22.22	.48	.33	9.78	12.18	.375	.58	.50	3.35
1892—No. 1617. Tulare	Aug. 26	22.30	21.80	.....	.35	.....	.....	.....	.....	.....	.....
No. 1729. Paso Robles	Oct. 1	22.05	.....	.47	.....	.....	.....	.....	.....	.....	.....
No. 1764. Mission San José	Oct. 12	19.75	19.54	.72	.....	7.78	9.73	.256	.84	.74	2.60
1893—No. 1888. Tulare	Sept. 22	20.20	19.08	.45	.31	7.78	9.73	.256	.53	.46	2.30
No. 1922. Paso Robles	Oct. 12	22.60	21.38	.45	.30	8.20	10.25	195	.53	.70	3.30
No. 2037. Cupertino	Nov. 1	23.10	.....	.69	.....	.....	.....	.432	.98	.....	.....
No. 2062. Mission San José	Nov. 1	22.60	21.40	.65	.21	8.27	10.36	.301	.74	.62	2.60
1894—No 2174. Amador station	Sept. 24	21.50	.....	.56	.....	.....	.....	.....	.....	.....	.....
No. 2206. Tulare	Sept. 27	23.60	.....	.47	.....	.....	.....	.....	.....	.....	.....
No. 2216. Paso Robles	Sept. 28	22 30	.....	.53	.....	.....	.....	.....	.....	.....	.....
No. 2264. Mission San José	Oct. 5	20.50	.....	.57	.....	.....	.....	.203	.....	.....	.....

COLOR READINGS.

MONDEUSE.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.	Six Months.
1891—No. 1563. Mission San José	.....	65.5 1VR	42.5 2VR	26.8 3VR	27.0 4VR	.....	.....
No. 1582. Mission San José	90.9 1VR	52.0 1VR	42.5 1VR	37.3 1VR	27.7 4VR	.....	.....
No. 1595. Kenwood, Sonoma County	88.8 1VR	66.6 2VR	45.9 3VR	47.6 4VR	38.0 5VR	.....	.....
1892—No. 1764. Mission San José	111.0 2VR	108.0 2VR	38.8 2VR	33.9 1VR	29.2 1VR	32.0 1VR	16.0 3VR
1893—No. 1888. Tulare	28.4 1VR	30.8 1VR	17.4 2VR	14.0 3VR	14.0 4VR	13.1 5VR	.....
No. 1922. Paso Robles	121.0 VR	38.0 1VR	37.4 1VR	38.0 2VR	27.2 3VR	29.4 3VR	.....
No. 2037. Cupertino	50.6 1–2VR	.....	.....	.....	.....	.....	.....
No. 2062. Mission San José	93.0 VR–1VR	48.2 1VR	50.0 1–2VR	50.0 1–2VR	.....	.....	.....
1894—No. 2264. Mission San José	76.9 VR	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1312. *Mondeuse*, from J. T. Doyle, Cupertino. Received October 10, 1890, in good condition, and mature. The must showed 20.4% of solid contents by spindle. The temperature of the grapes at crushing was 62°, and the maximum reached was 79°, on the fifth day. The murk was drawn off on the sixth day, when it was nearly dry.

At one month the wine was clear and showed high acid and astringency. At two months it was racked, and at three it had a light bouquet, good flavor, clean taste; was rough but promising. The lees showed some unsound ferments, so the wine was pasteurized. At seven months the wine was bright, improved in bouquet and flavor, smoother, and maturing well. At fifteen months it was in good condition, very fresh and clean-tasting, and nearly mature. It was bottled, part at seventeen and part at twenty-three months. At three years the wine first bottled was bright, very pleasant, smooth, and clean-tasting. The second bottling had not kept well.

No. 1334. *Mondeuse*, from Mission San José. Received October 14, 1890, in good condition, and mature. The must showed 21.7% of solid contents by spindle. The temperature of the grapes at crushing was 68°, and the maximum reached was 92°, on the fourth day. On the fifth day the murk was nearly dry, and on the sixth was drawn off.

In three weeks the wine was clear, but very raw-tasting. At six weeks it showed marked flavor and aroma, clean taste, full acid and tannin, and, in general, good quality. In three months it had progressed well, its bouquet and flavor were good, and it tasted quite sound, though the lees showed a few filaments. It was pasteurized for safety. Two months after pasteurizing it was in good condition, showed good acid and body, and was aging well. At nine months it was racked for the third time. At fifteen months it was very bright, had excellent color, and was generally good but for a slight odor of butyric acid. It was bottled at twenty-six months. At three years the wine in bottle was bright, smooth, and agreeable, but not quite clean-tasting.

No. 1563. *Mondeuse*, from Mission San José. Received October 9, 1891, in good condition, and mature; some of the grapes were shriveled. The must showed 22.15% of solid contents by spindle. The temperature of the must at crushing was 60°, and the maximum reached was 85°, on the fourth day. The murk was dry on the fifth day, when it was drawn off.

At five weeks the wine was bright, full-flavored, and showed high acid and astringency. It remained bright, was racked twice during the first ten months, developed some bouquet, but was somewhat harsh. The lees showed a good deal of *S. pastorianus*. The wine continued sound, and improved much in aging. It was bottled, part at sixteen and part at twenty-one months. At three years the wine bottled at ten months was bright, of good color, bouquet, and flavor, but a little raw; at sixteen months it was better, clean-tasting, and of high flavor; at twenty months not quite so good as at sixteen months. The wine was rather thin and lacking in body.

No. 1582. *Mondeuse*, from Mission San José. Received October 16, 1891, in fair condition. The must showed 22.6% of solid contents by spindle. The temperature of the grapes at crushing was 68°, and the maximum attained was 85°, on the third day. The murk was dry on the fourth day, when it was drawn off.

In one month the wine was clear, with full and pleasing flavor, some aroma, good astringency and acid. At two months it was bright and in good order. It remained bright, and the lees developed much *S. pastorianus*. At eight months the wine was bright, very smooth, and pleasing, with high bouquet, and maturing quickly. It was racked for the second time at ten months. At fifteen months it was in excellent order, and nearly mature. A month later it was bottled. At three years the bottled wine was bright and of good bouquet and flavor, but a little lacking in color and body. Blended with No. 1582, a full-bodied, heavy-colored Alicante Bouschet, it was much improved.

No. 1595. *Mondeuse*, from A. Macartney, Los Guilicos, Sonoma County. Received October 19, 1891, in good condition, but a little past maturity. The must showed 23.7% of solid contents by spindle. The temperature of the grapes at crushing was 64°, and the maximum reached was 82°, on the third day. The murk was drawn off on the fourth day while still sweet. It was dry on the eighth day.

In one month the wine was clear, possessed of good flavor and some aroma; it was very rough, with high astringency. It was racked at two months, and at five was bright, a full-bodied, well-rounded wine in excellent order. It was racked again at eight months, and remained bright, maintaining its high quality. At fifteen months it was in first-class condition, with excellent bouquet and flavor, and had kept perfectly in spite of the smallness of the sample (two gallons). At this date it was bottled. At three years the bottled wine was bright, with good color and bouquet, excellent flavor, and clean taste; an extremely good wine of high body, full but pleasing acid and astringency, and high vinosity.

No. 1617. *Mondeuse*, from Tulare station. Received August 29, 1892, in good condition, and mature. The must showed 22.3% of solid contents by spindle. This sample was fermented with No. 1616, Serine, from Tulare.

No. 1729. *Mondeuse*, from Paso Robles station. A sample for must analysis was received October 3, 1892, in good condition. The must showed 22.05% of solid contents by spindle.

No. 1764. *Mondeuse*, from Mission San José. Received October 15, 1892, in good condition. The must showed 19.75% of solid contents by spindle. The temperature of the grapes at crushing was 58°, and the maximum reached was 85°, on the fourth day. The murk was still a little sweet on the fifth day, and was drawn off on the sixth.

The wine was not very prompt in clearing, but was nearly clear at one month, when it was racked. At three months it was bright, with high acid and astringency, raw but promising. It remained harsh and green for some time, but continued sound, and developed some bouquet. At fourteen months it had somewhat softened down and possessed a light and delicate bouquet; it was, however, still a little harsh and not quite mature. It was bottled at eighteen months.

No. 1888. *Mondeuse*, from Tulare station. Received September 22, 1893, in good condition. The bunches were large and well filled; the berries were of medium size, juicy, soft, mature, the skin very astringent. The must showed 20.2% of solid contents by spindle. The temperature of the grapes at crushing was 65°, and the highest temperature reached was 83°, on the second day. The murk was still a little sweet on the fourth day, and was drawn off on the fifth.

In three weeks it was clear, and was then racked and taken to the cellar. In four months it was bright, well flavored, with some bouquet, high astringency, adequate acid—a clean-tasting, good wine, one of the best of the Tulare red wines. At six months it had been racked twice, and remained bright, sound, fresh, and agreeable.

No. 1922. *Mondeuse*, from Paso Robles station. Received October 12, 1893, in good condition. The bunches were irregular, loose, rather small; the berries small. The grapes were mature and some of them dried. The must showed 22.6% of solid contents by spindle. The temperature of the grapes at crushing was 69°. The fermentation lasted five days, and was cool, owing to the small size of the sample.

In three weeks the wine was clear, of good flavor, with moderate acid and pleasing astringency. It soon became bright, and at seven months was an agreeable wine, in excellent condition, but a little green.

No. 2037. *Mondeuse*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received October 31, 1893, in good condition. The bunches were over medium in size, long conical, close, with small wings; the berries were of medium size, somewhat shriveled, but fresh-tasting and with abundant acid. The must showed 23.1% of solid contents by spindle.

No. 2062. *Mondeuse*, from Mission San José. Received November 1, 1893, in good condition. The bunches were of medium size, conical, shouldered or with small wings, loose but well filled; the berries were of medium size, very slightly oval, juicy, well flavored, and the skin very astringent. The must showed 22.6% of solid contents by spindle. The temperature of the grapes at crushing was 62°, and the maximum reached was 85°, on the fourth day. The murk was dry on the fifth day, and was drawn off on the sixth.

In three weeks the wine was nearly clear, and was racked and taken to the cellar. At three months it was bright, well-flavored, clean-tasting, with good acid and astringency—an excellent wine but for a slight moldy color. At six months it had been racked twice, and was in good condition and showed improvement.

CÉSAR.

Synonyms: Romain; Picarniau.

Description.—Vine vigorous and productive; canes strong, semi-erect, with long joints; leaves of medium size, wrinkled, glabrous above, tomentose below, five-lobed, with open sinuses; bunches over average size, close, conico-cylindrical, with strong peduncles; berries of medium size, round, with thick skin, and firm but juicy flesh.

The César is rather widely cultivated in the Auxerrois, where it is considered the most valuable variety next to the Pinots. In character it is much more nearly allied to the Mondeuse and Sirah than to the Pinots, and is therefore put in this group. Its wine is not of such high quality as that of the Franc Pinot, but is much esteemed, and when grown on hillsides is of good body and color. On low or very rich soils the vine runs too much to wood, and coulures. This tendency can be combated to some extent by training on trellis with long arms and short-pruning. On hillsides it bears well with ordinary short-pruning. This variety has been tested to such a limited extent in California that little can be said as to its adaptability. Its wine is of very different character from

that of the Pinots, being highly astringent and deeply colored. The only sample made at the station did not keep very well, but that is to be accounted for by the overripe and crushed condition of the grapes when they arrived.

ANALYSIS OF No. 1594, CÉSAR, FROM KENWOOD.

Must—	
Solid contents by spindle	26.50%
Sugar by copper test	26.31
Acid as tartaric	.50
Ash	.37
Wine—	
Alcohol by volume	13.54
Acid at pressing	.50
Acid at six months	.40
Tannin	.544
Body	3.35

COLOR READINGS.

At pressing	222.0	VR
At one month	88.8	1VR
At two months	72.0	1VR
At three months	68.0	2VR
At four months	51.2	2VR

RECORD OF TREATMENT.

No. 1594. *César*, from A. Macartney, Kenwood, Sonoma County. Received October 19, 1891, in fair condition, a little crushed and moldy, somewhat past maturity, many of the grapes being dried up. The bunches were over average in size, conico-cylindrical, sparingly winged, not compact, but well filled with round, well-colored and medium-sized berries. The must showed 26.5% of solid contents by spindle and 0.50% of acid. The temperature of the grapes at crushing was 64°, and the maximum reached was 97°, on the fourth day. The wine was drawn off on the fifth day, while still sweet and fermenting. On the eighth day it was dry.

At one month the wine was not quite clear, was full-bodied and of high astringency, and with still a suspicion of sugar. At two months it was bright, with little bouquet, full flavor, and very good but for a taste of dried grapes. The wine was racked, and two months later it showed signs of some secondary fermentation. At one year the wine was good, except for some bitterness caused by secondary fermentation. At twenty-two months it was bottled. Eighteen months after bottling the wine was clear, of deep color, heavy body, a very full, rich wine, but injured by secondary fermentation.

ETRAIRE DE L'ADHUI.

This grape is considered by some authorities as a distinct variety from the Persan, and by others as simply an improved variation obtained by selection. It is extensively cultivated in the valley of L'Isère, where it is said to be vigorous, hardy, and fertile. It is especially suited to hills, and requires short-pruning. The wine is noted for its good body and excellent keeping qualities. It is generally fermented with one tenth of some white grape to improve its delicacy and vinosity. One of the most valued attributes of this variety is its almost perfect resistance to the mildew (*Peronospora*). So far, this variety has not sustained its European reputation as a prolific bearer at any of the stations. The analyses of the musts, however, indicate that its characteristic robustness is not lost here. It is noticeable for the full amount of acid which it maintains with high sugar; No. 1395, from Cupertino, with 29% of sugar and 1.15% of acid, is remarkable. The wine has sufficient color, nearly equal to that of the Mondeuse. The wines of these two varieties are said to be very similar in France; here the indications are that the Etraire would make a somewhat heavier wine than the Mondeuse.

ANALYSES OF MUSTS AND WINES.

ETRAIRE DE L'ADHUI.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test.	Acid as Tartaric.	Ash.	WINE. Tannin	Total Acid as Tartaric, at Pressing
1890—No. 1395. Cupertino	Oct. 17	29.10	.....	1.15	.....	.....	.....
1893—No. 2118. Cupertino	Nov. 1	25.70	.....	.77	.....	.352	.62
1894—No. 2296. Mission San José	Oct. 12	23.50	.....	.75	.....	.153	.75

COLOR READINGS.

ETRAIRE DE L'ADHUI.	At Pressing.	
1893—No. 2118. Cupertino	62.5	1VR
1894—No. 2296. Mission San José	59.7	2-3VR

RECORD OF TREATMENT.

No. 1395. *Etraire de l'Adhui*, from Cupertino. A sample for must analysis received October 21, 1890, in fair condition, but overripe. The must showed 29.1% of solid contents by spindle and 1.15% of acid.

No. 2118. *Etraire de l'Adhui*, from Cupertino. A sample for must analysis was received November 1, 1893, in good condition, and mature. The bunches were of medium size, irregularly cylindrical, with small wings, well filled below, loose above; the berries were small, slightly elongated, soft, and juicy. The must showed 25.7% of solid contents by spindle and 0.77% of acid.

TINTA VALDEPEÑAS.

In southern Spain, where the bulk of the vineyards are planted with white grapes, it is the custom for each proprietor to keep a few red grapes for the making of small quantities of red wine for home use. These red grapes, which are of different varieties in the different districts, are called, indiscriminately, "Tintas." Among these varieties the only one of renown, or which produces a wine which finds its way beyond the place of its production, is the Tinta Valdepeñas.

The red wines of Valdepeñas have been famous since the days of Pliny, and now have the distinction of being the best if not the only good dry red wines of southern Spain. These wines do not seem to be all produced by the same grape. According to Portes and Ruyssen, many of the vineyards are planted with Burgundy grapes. The variety which has been imported into California, and which is described below, is, however, probably a native of Valdepeñas.

Description.—Leaves of medium size, coarsely and somewhat acutely dentate, deeply lobed, the upper sinuses very deep and often closed, the lower less deep but well marked, the petiolar quite closed; upper surface dark green, glabrous except when quite young, the lower grayish green, with fine tomentum and well-marked ribs; tips of the shoots yellowish and pubescent; bunches of medium size, conico-cylindrical, slightly shouldered, and close; berries of good size, round, with thick

and very astringent skin; peduncles herbaceous and slender, pedicels slender and about half the length of the berries, which are covered with an abundant bloom.

The description which modern authorities give of the red wines of Valdepeñas is identical with that given by Cervantes. They are, according to this author, heavy-bodied, with full vinosity and a slightly bitter taste.

In California this Tinta has made some excellent dry wines. The grapes attain a rather high degree of sugar and rather low acid, but ferment without much trouble. In the coast counties the wine is deeply colored, heavy-bodied, alcoholic, astringent, and of good quality, but not marked character. At Tulare this grape has given one of the best dry red wines of the district. It has sufficient and stable color, good vinosity, some bouquet, and clean taste. As in Spain, the wine is slightly but not unpleasantly bitter. It is evidently one of the red grapes most suited to the hotter parts of the State for the production of dry red wines. It is not a success for sweet wines, which are too rough and astringent.

ANALYSES OF MUSTS AND WINES.

TINTA VALDEPEÑAS.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
1890—No. 1402. J. T. Doyle, Cupertino	Oct. 19	19.80		.61							
1892—No. 1634. Tulare	Aug. 6	23.90		.24							
1893—No. 1902. Tulare	Sept. 29	24.55	23.61	.38	.49	9.56	11.91	.262	.46	.48	3.60
No. 1924. Paso Robles	Oct. 12	25.20	23.60	.41	.37	9.49	11.82	.205	.41	.56	3.10
No. 2041. J. T. Doyle, Cupertino	Oct. 30	26.90		.54				.320			
1894—No. 2156. Tulare	Sept. 17	25.10	24.64	.38				.222	.41	.35	2.95

COLOR READINGS.

TINTA VALDEPEÑAS.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1893—No. 1902. Tulare	30.5 1VR	13.1 4VR	14.0 5VR	11.5 1R	11.5 2R	9.8 2R
No. 1924. Paso Robles	37.4 VR	18.7 5VR	17.1 3VR	16.3 4VR	12.5 1R	11.0 1R
No. 2041. Cupertino	129.0 1–2VR					
1894—No. 2156. Tulare	38.4 1VR	19.4 4VR	18.0 5VR	12.0 3R		

RECORD OF TREATMENT.

No. 1402. *Tinta Valdepeñas*, from Cupertino. A sample for must analysis was received October 21, 1890. The grapes were in fair condition, but some were shriveled. The must showed 19.8° of solid contents by spindle and 0.61° of acid.

No. 1634. *Tinta Valdepeñas*, from Tulare station. A sample for must analysis was received on September 6, 1892, in good condition. The must showed 23.9° of solid contents by spindle and 0.24° of acid.

No. 1902. *Tinta Valdepeñas*, from Tulare station. Received September 29, 1893, in good condition, but a little overripe. The bunches were of medium size, conico-cylindrical, slightly shouldered, and close; the berries were of good size, round, with thick and very astringent skin; the peduncles were green and rather slender, the pedicels slender and about half the length of the berries, which were covered with abundant bloom. The composition of the must was 24.55° of solid contents by spindle and 0.38° of acid. The temperature of the grapes at crushing was 66°, and the maximum of 88° was reached on the fifth day. On the sixth day the murk was dry, and was drawn off.

At one month the wine was nearly clear, of good flavor, body, and high astringency. Two weeks later it was quite clear, tasted sound, but still contained a little sugar. At this date it was racked and taken to the cellar. At four months it was bright and nearly dry, with little bouquet, but of good body, tannin, and alcohol, and moderate acid—generally an agreeable wine, but a little flat. At seven months it had been racked three times, and was in good order and retained its good quality. At eleven months it had developed some bouquet and had improved generally. A week later the lees were examined and a few filaments found; the wine, however, was unaffected in taste, was nearly mature, and, considering the smallness of the sample, had kept very well. At seventeen months the wine was mature, retained its good qualities, and was bottled. One year from bottling the wine was bright, without deposit, clean-tasting, but with a slight bitterness. It had a little bouquet, good flavor, and full alcoholic strength. It was one of the best of the Tulare wines.

No. 1924. *Tinta Valdepeñas*, from Paso Robles station. Received October 12, 1893, in good condition. The grapes were somewhat overripe and shriveled; the bunches and berries were very small. The must showed 25.2° of solid contents by spindle and 0.41° of acid. There were only 40 pounds of grapes, and the fermentation, which started at 70°, was cool. It lasted five days, when the murk was drawn off quite dry.

Three weeks after pressing, the wine was nearly clear, full bodied, well flavored, with good astringency and moderate acid. It was racked twice, and became quite clear, but the smallness of the sample prevented it from being kept any length of time.

No. 2041. *Tinta Valdepeñas*, from Cupertino. Received October 31, 1893, in good condition. The bunches were large, conical, loose, on somewhat slender peduncles; the berries were large, nearly round, fleshy, on slender pedicels, and overripe. The must showed 26.9° of solid contents by spindle and 0.54° of acid.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF JURA TYPE.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle.	MUST. Sugar by Copper Test.	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume.	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing.	WINE. Total Acid as Tartaric. At 6 to 8 Months.	WINE. Body
	Sirah.										
1242	Fresno	1890	25.10	24.11	.43	.37	12.36	.244	.30	.48	2.70
1472	Fresno	1891	25.20		.48		12.36	.240	.51	.43	3.35
1278	Cupertino	1890	24.15		.67						
1370	Cupertino	1890	24.15		.52						
2044	Cupertino	1893	28.60		.58			.502			
2052	Cupertino	1893	28.20		.58			.553	.79		
1296	Mission San José	1890	25.30		.84	.22	12.46	.259	.71	.45	3.45
1341	Mission San José	1890	25.40		.64	.19	13.00	.301	.44	.38	3.32
1564	Mission San José	1891	27.35		.65		15.20	.411	.71	.43	3.20
1708	Mission San José	1892	23.25	23.13	.78	.35	11.55	.335	.83	.70	2.95
1952	Mission San José	1893	24.60		.94			.345	.77		
2076	Mission San José	1893	28.80	25.65	.63	.30	13.36	.256	.65	.67	3.30
2254	Mission San José	1894	23.70		.64			.236			
2269	Mission San José	1894	23.70		.68			.245			
1438	Tulare	1891	25.65		.37						
1616	Tulare	1892	23.70	22.23	.43	.30					
1635	Tulare	1892	25.10		.41						
1814	Tulare	1893	22.40	21.80	.62	.50	10.36	.141	.47	.51	3.20
2139	Tulare	1894	21.50	20.83	.65		11.00	.159	.58	.44	2.85
2153	Tulare	1894	24.00		.53						
1488	Paso Robles	1891	23.70		.50						
1492	Paso Robles	1891	24.80		.53						
1647	Paso Robles	1892	23.95		.69						
1879	Paso Robles	1893	22.60	20.99	.53	.43		.237	.46		
1895	Paso Robles	1893	25.85	25.53	.51	.37	12.36	.211	.51	.50	3.30
1664	Amador station	1892	26.40		.42						
2286	Amador station	1894	23.50		.48						
	Average, Fresno		**25.15**	**24.11**	**.45**	**.37**	**12.36**	**.242**	**.40**	**.45**	**3.03**
	Average, Cupertino		**26.28**		**.59**			**.528**	**.79**		
	Average, Mission San Jose		**26.01**	**24.39**	**.72**	**.26**	**13.11**	**.298**	**.68**	**.52**	**3.24**
	Average, Tulare		**23.72**	**21.62**	**.50**	**.40**	**10.68**	**.150**	**.53**	**.48**	**3.02**
	Average, Paso Robles		**24.18**	**23.26**	**.55**	**.40**	**12.36**	**.224**	**.48**	**.50**	**3.30**
	Average, Amador station		**24.95**		**.45**						

SUMMARY OF ANALYSES OF MUSTS AND WINES OF JURA TYPE—Continued.

Number	LOCALITY	Vintage of	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol by Volume	Tannin	Total Acid as Tartaric. At Pressing	At 6 to 8 Months	Body
	Mondeuse.										
1312	Cupertino	1890	20.40		.79	.21	9.73	.237		.45	2.70
2037	Cupertino	1893	23.10		.69			.432		.98	
1334	Mission San José	1890	21.70		.76	.21	11.00	.291	.58	.50	2.58
1563	Mission San José	1891	22.15		.68		11.09	.259	.77	.53	2.30
1582	Mission San José	1891	22.60	22.22	.53		11.45	.272	.68	.43	2.70
1764	Mission San José	1892	19.75	19.54	.72		9.73	.256	.84	.74	2.60
2062	Mission San José	1893	22.60	21.40	.65	.21	10.36	.301	.74	.62	2.60
2261	Mission San José	1894	20.50		.57			.203			
1595	Kenwood	1891	23.70	22.22	.48	.33	12.18	.375	.58	.50	3.35
1617	Tulare	1892	22.30	21.80		.35					
1888	Tulare	1893	20.20	19.08	.45	.31	9.73	.256	.53	.46	2.30
2206	Tulare	1894	23.60		.47						
1729	Paso Robles	1892	22.05		.47						
1922	Paso Robles	1893	22.60	21.38	.45	.30	10.25	.195	.53	.70	3.60
2216	Paso Robles	1894	22.30		.53						
2174	Amador station	1894	21.50		.56						
	Average, Cupertino		**21.75**		**.74**	**.21**	**9.73**	**.335**		**.72**	**2.70**
	Average, Mission San Jose		**21.55**	**21.05**	**.65**	**.21**	**10.73**	**.262**	**.72**	**.56**	**2.55**
	Average, Tularo		**22.03**	**20.44**	**.46**	**.33**	**9.73**	**.256**	**.53**	**.46**	**2.30**
	Average, Paso Robles		**22.32**	**21.38**	**.48**	**.30**	**10.25**	**.195**	**.53**	**.70**	**3.30**
	César.										
1594	Kenwood	1891	26.50	26.31	.50	.37	13.54	.544	.50	.40	3.35
	Etraire de l'Adhui.										
1395	Cupertino	1890	29.10		1.15						
2118	Cupertino	1893	25.70		.77			.352	.62		
2296	Mission San José	1894	23.60		.75			.153	.75		
	Average, Cupertino		**27.40**		**.96**			**.352**	**.62**		

	Tinta Valdepeñas.											
1402	Cupertino	1890	19.80		.61							
2041	Cupertino	1893	26.90		.54			.320				
1634	Tulare	1892	23.90		.24							
1902	Tulare	1893	24.55	23.61	.38	.49	11.91	.262	.46	.48	3.60
2156	Tulare	1894	25.10	24.64	38			.222	.41	.35	2.95
1924	Paso Robles	1893	25.20	23.60	.41	.37	11.82	.205	.41	.56	3.10
	Average, Cupertino		**23.35**		**.58**			**.320**			
	Average, Tulare		**24.52**	**16.08**	**.33**	**.49**	**11.91**	**.242**	**.44**	**.42**	**3.28**

SOUTHERN FRENCH TYPE.

(See Vit. Rept. 1887-89, p. 166.)

The conditions of the vast vine-growing district of Southern France are such as to make the production of large quantities of wine of medium quality more desirable than smaller quantities of high-class wines. We thus find that all the varieties of vines cultivated extensively there are heavy bearers and produce wines more suitable to blending purposes than for direct consumption. Of these varieties several have been planted extensively in California, and in many cases have given excellent results.

The *Carignane* and *Mataro*, which are the most extensively cultivated in France, have been given a large place in California vineyards. They give good results, however, only on warm, well-drained soils and in early localities. Contrary to the experience in France, the Carignane gives here, in almost every case, a wine of higher quality than the Mataro. On rich, low soils, though it bears well, it gives a poor wine, lacking in color and quality.

The *Grenache* and *Mourastel* cannot be recommended for any locality yet tried, though the former has been used to make some fair sweet, white wines. The *Ploussard* may be considered as a failure.

The *Cinsaut* is not well adapted to the cooler portions of the State, where its sugar content does not go sufficiently high; but it is a heavy and regular bearer, and in the hot valleys would probably develop the qualities for which it is noted in France. On account of its handsome aspect and pleasant flavor, it would be useful to a limited extent as a table grape for local markets.

The *Aramon* is worthy of further trial, and will doubtless be of use for the production of light, red wines in some localities. In the hot central valleys it makes a fair wine, easily fermented, but totally lacking in color, and generally too light and thin. In the cooler coast counties it generally fails to ripen properly; but in early seasons, when the crop is moderate, it makes a very agreeable light wine, with brilliant and sufficient color. In the warmer exposures of the earlier parts of the coast counties it will make a good light wine for early consumption, as it matures very quickly. It will doubtless be found useful for blending with heavier wines.

The *Petit Bouschet* has not been an unqualified success. As a coloring grape it is equaled or surpassed by grapes of higher quality in localities where the production of color is difficult; while in other localities its coloring properties are not needed, and its wine is not generally of high enough quality, to be worth growing for itself in the presence of superior kinds. The best results that have been obtained with it have been on heavy clay soils.

The *Bastardo* and *Trousseau*, which closely resemble each other, may be considered as of doubtful value under our conditions.

The *Beclan* is placed in this category on account of the character of its wine, which, though suitable for blends with fine wines, resembles the Southern French wines in its smoothness, low acidity, and neutrality. It is for this reason an excellent grape to plant in connection with the rougher Medoc or Jura grapes, to soften and diminish their too intense character.

ARAMON.

(See Vit. Rept. 1883–85, p. 105; 1887–89, p. 166.)

The later analyses of this variety show that the deficiency in acid noticed at first was in all probability due to the youth of the vines, as since then it has shown from medium to full acid at all localities. The average composition of the must has been: at Mission San José, sugar 22.35%, acid 0.62%; and at Cupertino, sugar 22.3%, acid 0.52%. At Tulare this vine is a strong grower and immense bearer, yielding eight to ten tons per acre with short-pruning. As much as 84 lbs. have been taken from one vine in the row. The grapes attain a fair amount of sugar and acid, considering the size of the crop, but when the crop is very large they are very deficient in tannin. The grapes have the pleasant astringent taste so characteristic of the Aramon, but the percentage of skin is so small that the wine is seldom astringent enough when made up pure. The wine is also almost totally lacking in color and low in body. As a blending wine it is useful, on account of the productiveness of the vine, and because of its agreeable and somewhat delicate flavor. Blended with one third Tinta Amarella and one sixth Petit Bouschet, it has given good results. The indications are that it is better suited to the production of white wines than of red. At the Amador station in the foothills the Aramon is a healthy, strong grower, and yields regularly about four tons per acre with short-pruning. It gives more sugar than at Tulare, and has sufficient color.

Analyses of Musts and Wines.

ARAMON.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight.	Alcohol. By Volume.	Tannin	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At Six Months.	Body
1890—No. 1246. Fresno	Aug. 24	21.10	20.99	.65	.36	8.48	10.58	.248	.50	.39	2.82
No. 1377. Mission San José	Oct. 18	22.10	.....	.81	.29	9.20	11.45	.149	.71	.36	2.58
No. 1414. Cupertino	Oct. 28	23.00	.....	.51	.22	9.78	12.18	.298	.62	.44	2.82
1891—No. 1436. Tulare	Aug. 24	20.20	.....	.53	.....	.....	.....	.....	.....	.....	.....
No. 1474. Fresno	Aug. 28	21.50	.....	.57	.....	8.34	10.42	.210	.66	.44	2.60
1892—No. 1639. Tulare	Sept. 12	21.50	20.44	.57	.34	8.84	11.00	.242	.53	.44	2.65
No. 1659. Amador station	Sept. 16	20.30	.....	.76	.....	.....	.....	.....	.....	.....	.....
No. 1755. Paso Robles	Oct. 12	21.50	.....	.48	.....	.....	.....	.....	.....	.....	.....
1893—No. 1826. Amador station	Sept. 7	18.60	.....	.86	.23	.....	.....	.182	.86	.....	.....
No. 1918. Tulare	Oct. 9	21.50	19.21	.74	.44	7.92	9.90	.147	.68	.47	2.60
No. 2054. Cupertino	Nov. 1	23.40	.....	.62	.....	.....	.....	.345	.79	.....	.....
1894—No. 2178. Amador	Sept. 24	20.40	.....	.67	.....	.....	.....	.....	.....	.....	.....
No. 2290. Tulare	Oct. 11	22.85	21.80	.48	.....	8.48	10.58	.052	.56	.....	2.65
No. 2290*a*. Tulare	Oct. 11	22.85	21.80	.48	.....	.....	10.75	.285	.42	.58	2.60
No. 2299. Mission San José	Oct. 13	22.80	.....	.61	.....	.....	.....	.147	.72	.....	.....
No. 2316. Amador station	Oct. 15	23.40	.....	.45	.....	.....	.....	.....	.....	.....	.....

Color Readings.

ARAMON.	At Pressing.	One Month.	Two Months.	Three Months.
1891—No. 1474. Fresno	3.33 5VR+Y	Too light to be read on scale.		
1892—No. 1639. Tulare	Too light to be read on scale.			
1893—No. 1826. Amador station	21.0 4VR	.....	.....	.....
No. 1918. Tulare	6.1 VR+Y	.....	.....	.....
No. 2054. Cupertino	34.8 1–2VR	.....	.....	.....
1894—No. 2290*a*. Tulare*	36.0 1VR	27.2 1–2VR	18.6 5VR	16.3 4VR
No. 2299. Mission San José	38.0 1VR	.....	.....	.....

Blend ½ Aramon, ⅓ Tinta Amarella, ⅙ Petit Bonschet.

RECORD OF TREATMENT.

No. 1246. *Aramon*, from Margherita Vineyard, Fresno. Received August 26, 1890, in good condition, and mature. The must showed 21.1% of solid contents by spindle. The temperature of the grapes at crushing was 67°, and the maximum reached was 82°, on the third day. The murk was dry on the fifth day, when it was drawn off.

In three weeks the wine was nearly clear, and was racked. At three months it was clear, almost without color, of neutral but rather pleasing flavor, no bouquet, full astringency, and medium acid. A few days later lactic ferments were found in the lees, and the wine was pasteurized. At eight months it was clear, thin, and characterless, but with agreeable astringency. At fifteen months it was bright, with little bouquet or flavor, perfectly neutral, but still agreeable, and nearly mature. At seventeen months it was bottled. At three years the bottled wine was tasted, and found bright and in good condition, of a dark straw color, agreeably astringent, but without quality.

No. 1377. *Aramon*, from Mission San José. Received October 20, 1890, in fair condition; a few grapes were moldy, the bunches large and well filled. The must showed 22.1% of solid contents by spindle. The temperature of the grapes at crushing was 68°, and the maximum reached was 96°, on the fourth day. The murk was dry on the fifth day, when it was drawn off.

In one month the wine was nearly clear, with pleasant flavor and aroma, medium acid and astringency; in general, of good quality. It remained sound and in good condition for four months, when the after-taste had become a little suspicious, so the wine was pasteurized. It improved slightly for about ten or twelve months, after which it commenced to deteriorate, and soon became flat and poor. It was bottled at eighteen months, but did not improve in glass.

No. 1414. *Aramon*, from J. T. Doyle, Cupertino. Received October 30, 1890, in good condition. The must showed 23.0% of solid contents by spindle. The temperature of the grapes at crushing was 68°, and the maximum reached was 93°, on the third day. The murk was nearly dry on the fourth day, when it was drawn off.

In one month the wine was not quite clear, had good flavor and aroma, low acid, and full astringency. At three months it was clear, with pleasing bouquet and full flavor, still rough, but of good quality and with sufficient alcohol and body. After this the wine did not improve, and soon commenced to deteriorate. The wine was racked three times during the first year, and remained bright. The wine was bottled, part at sixteen and part at twenty-two months. At three years the bottled wines were tasted and found bright, fairly agreeable, but lacking in character and showing some bad acid.

No. 1436. *Aramon*, from Tulare station. A sample for must analysis was received August 27, 1891, in good condition. The must showed 20.2% of solid contents by spindle.

No. 1474. *Aramon*, from Margherita Vineyard, Fresno. Received August 31, 1891, in good condition. The must showed 21.5% of solid contents by spindle. The temperature of the grapes at crushing was 70°, and the maximum reached was 80°, on the third day. The murk was still a little sweet on the seventh day, when it was drawn off.

The wine was a little slow in clearing, but was clear in six weeks from crushing, clean-tasting, and with some flavor and aroma. It was racked three times during the first year, and remained in good order. It was at its best at about six months, when it was a light, agreeable, somewhat acid wine, sound, but with little character. After this it deteriorated, owing partly to the smallness of the sample. At sixteen months it was bottled; it had lost nearly all its color and looked like a white wine. At three and a half years the bottled wine was bright, without deposit; had good flavor, a little bouquet, and sufficient tannin; an agreeable wine but for slight odor of volatile acid.

No. 1639. *Aramon*, from Tulare station. Received September 15, 1892, in good condition. The must showed 21.5% of solid contents by spindle. The temperature of the grapes at crushing was 66°, and the maximum reached was 97°, on the fourth day. The murk was not quite dry on the fourth day, when it was drawn off.

In one month from crushing the wine was nearly clear, dry, and was racked and taken to the cellar. At four months it was nearly bright, with little bouquet, flavor, or color, but with full astringency and clean taste, promising to be a good neutral wine. It was racked for the second time at eight months, and after this did not improve, but lost all its color and became flat. At fifteen months it was bright, but flat, and not nearly as good a wine as the Carignane or Petit Bouschet of the same locality. It was bottled at nineteen months.

No. 1659. *Aramon*, from Amador station. A sample for must analysis was received September 19, 1892, in poor condition. The must showed 20.3% of solid contents by spindle.

No. 1755. *Aramon*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 21.5% of solid contents by spindle.

No. 1826. *Aramon*, from Amador station. Received September 8, 1893, in good condition. The bunches were small; the berries were small and not mature. The must showed 18.6% of solid contents by spindle.

No. 1918. *Aramon*, from Tulare station. Received October 9, 1893, in good condition. The bunches were irregular, large, well filled, but not close; the berries were very large, round, with little color, firm, juicy, mature, but not very sweet. The must showed 21.5 of solid contents by spindle. The temperature of the grapes at crushing was 66°, and the maximum reached was 95°, on the third day.

In three weeks the wine was nearly clear, and had very little color. In three months it was clear, clean-tasting, had a little bouquet and flavor, medium astringency, and low acid; in general, was a fair wine, but with hardly any color. At four months it was racked for the second time; at six months it had not improved much, and lacked bouquet and freshness.

No. 2054. *Aramon*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received October 31, 1893, in good condition. The bunches were over medium size, conical, well filled; the berries were large, round, crisp, juicy, and well colored. The must showed 23.4 ° of solid contents by spindle.

CINSAUT.

(See Vit. Rept. 1883–85, p. 104; 1885–86, p. 84; 1887–89, p. 212.)

Further experiments with the Cinsaut have confirmed its unsuitableness for the production of any but very common wines in the Bay region, if used alone. It is possible, however, to improve it very much and to make a very fair wine by judicious addition of some other grape in the fermenting-vat. No. 1789, a blend of 80 ° Cinsaut with 20 ° Alicante Bouschet, was a good ordinary wine with medium acid, astringency, and body, and good color. It had little character, but was smooth and pleasing. At Tulare the vine is a strong grower and good bearer, resisting alkali well and giving from six to seven tons per acre. On account of the large size and compactness of the bunches the grapes are subject to injury by the black mold (*Aspergillus niger*), which in the lower part of the San Joaquin Valley is so destructive to Zinfandel and other thin-skinned grapes with close bunches. The must attains a fair amount of sugar and medium acid, and ferments well. The wine is almost without color, of pleasant flavor, very low in tannin, and a poor keeper. It could doubtless be much improved by an addition of Refosco or Petit Bouschet. It makes a better white than red wine, but in this case also it is much improved by cutting with another wine, for instance with Burger. So far, the vines have not borne well at Paso Robles, nor at the Amador station, and at the latter they have been subject to coulure.

Analyses of Musts and Wines.

CINSAUT.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1890—No. 1408. Mission San José	Oct. 26	22.35	.....	.44	.21	9.92	12.36	.122	.....	.41	2.58
1891—No. 1434. Tulare	Aug. 24	25.20	24.22	.52	.64	9.86	12.00	.120	.42	.30	3.80
No. 1477. Paso Robles	Aug. 30	18.60	.....	.58	.....	.....	.....	.....	.....	.....	.....
1892—No. 1614. Tulare	Aug. 26	22.05	22.24	.58	.....	8.77	10.90	.103	.43	.47	2.95
No. 1655. Paso Robles	Sept. 13	22.60	.....	.57	.....	.....	.....	.....	.....	.....	.....
No. 1789. Mission San José	Oct. 19	22.10	.....	.53	.....	9.56	11.91	.196	.60	.50	2.70
1893—No. 1825. Amador station	Sept. 7	21.05	.....	.69	.....	.....	.....	.284	.83	.....	.....
No. 1842. Tulare	Sept. 11	21.95	20.24	.62	.37	8.84	11.00	.083	.52	.49	2.60
No. 2050. Cupertino	Nov. 1	19.10	.....	.61	.....	.....	.....	.467	.79	.....	.....
1894—No. 2138. Tulare	Sept. 10	22.00	21.38	.47	.....	8.48	10.58	.136	.42	.42	2.60
No. 2159. Amador station	Sept. 17	26.50	.....	.45	.....	.....	.....	.....	.....	.....	.....
No. 2307. Mission San José	Oct. 13	20.85	.....	.44	.....	.....	.....	.....	.....	.....	.....

Color Readings.

CINSAUT.	At Pressing.		One Month.		Two Months.		Three Months.		Four Months.		Five Months.	
1891—No. 1434. Tulare	7.8	5VR+Y	5.5	VR+2Y	3.3	3R+2Y	.....	.....	.....	.....	.....	.....
1892—No. 1614. Tulare	5.5	2VR+Y	3.8	5VR+2Y	.....	.....	.....	.....	.....	.....	.....	.....
No. 1789.* Mission San José	62.5	1VR	57.1	1VR	52.0	2VR	34.5	3VR	31.0	3-4VR	29.2	3-4VR
1893—No. 1825. Amador station	45.6	1VR	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
No. 1842. Tulare	4.2	1R	6.2	1VR+Y	.....	.....	.....	.....	.....	.....	.....	.....
No. 2050. Cupertino	30.8	1-2VR	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894—No. 2138. Tulare	10.0	3R+Y	4.4	(Y)	4.2	(Y)	4.1	(Y)	.....	.....	.....	.....

*Blend of Cinsaut and Alicante Bonschet.

RECORD OF TREATMENT.

No. 1408. *Cinsaut*, from Mission San José. Received October 29, 1890, in good condition, and mature. The must showed 22.35 % of solid contents by spindle and 0.44% of acid. The temperature of the grapes at crushing was 68°. The fermentation was carried on in a closed vat, and without foulage. At the end of two weeks the vat was opened; the cap was hard and smelled perfectly sound; the space above was filled with gas, and the wine was quite dry.

In one month the wine was clear, of pleasing flavor and aroma, clean taste, low acid, and medium astringency; in general, the wine was very agreeable. Two weeks later it was racked in good order, and the lees seemed to be sound. At three months, however, the lees showed many filaments and the taste was affected. The wine was pasteurized, but remained flat and quite ceased to improve.

No. 1434. *Cinsaut*, from Tulare station. Received August 27, 1891, in good condition. The must showed 25.2 % of solid contents by spindle and 0.52 % of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 92°, on the fourth day. On the sixth day the murk was dry, and was drawn off.

In three weeks the wine was nearly clear and quite dry. A month later it had become a little cloudy, and tasted bitter and suspicious of secondary fermentations; it was pasteurized, and at four months was clear; it had developed some bouquet, but tasted thin and insipid. After this it gradually deteriorated, and at nine months it had lost nearly all its character and was quite valueless.

No. 1477. *Cinsaut*, from Paso Robles station. A sample for must analysis arrived in good condition September 3, 1891. The grapes were not quite mature; the berries were rather small for the variety, but well colored and the bunches well filled. The must showed 18.6 % of solid contents by spindle and 0.58 % of acid.

No. 1614. *Cinsaut*, from Tulare station. Received August 29, 1892, in good condition, except for a few bunches covered with black mold, which were rejected; some bunches were not quite mature. The must showed 22.05 % of solid contents by spindle and 0.58 % of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 96°, on the fifth day. On the seventh day the murk, being nearly dry, was drawn off.

In one month the wine was clear, clean-tasting, and perfectly dry. At four months it had been racked twice, and was clear, but had an unpleasant odor; the lees were sound. At six months the wine was clear and had changed little, but the lees showed some filaments, and it was therefore pasteurized. After this it gradually deteriorated, becoming flat and insipid.

No. 1655. *Cinsaut*, from Paso Robles station. A sample for must analysis was received September 16, 1892. The must showed 22.6 % of solid contents by spindle and 0.57% of acid.

No. 1789. *Cinsaut*, from Mission San José. Received October 21, 1892, in poor condition. The must showed 22.1 % of solid contents by spindle and 0.53 % of acid. The temperature of the must at crushing was 64°, and the maximum reached was 87°, on the third day. On the fourth day the murk was dry, and was drawn off. This sample was fermented with No. 1790 in the proportion of 80 % of Cinsaut to 20 % of Alicante Bouschet.

The wine was racked one month after pressing, and at three months was clear, clean-tasting, but still a little sweet. At five months it was in good condition, smooth, full-bodied, not quite dry, but sound both according to taste and to the microscopic examination of the lees. At seven months it was racked for the second time, and the lees were found still sound. At fourteen months the wine was bright, perfectly dry, smooth, and pleasing, with little bouquet or flavor, but agreeable acid and astringency. It was mature, and part of it was bottled; the rest was bottled at eighteen months.

No. 1825. *Cinsaut*, from Amador station. A sample for must analysis was received September 8, 1893, in good condition; the bunches were loose and coulured, the berries small. The must showed 21.05 % of solid contents by spindle and 0.69 % of acid.

No. 1842. *Cinsaut*, from Tulare station. Received September 12, 1893, in good condition. The bunches were large, well filled, and unevenly colored, the larger bunches having berries with hardly any color at all; the berries were very fine and large, and tasted mature. The must showed 21.95 % of solid contents by spindle and 0.62 % of acid. The grapes were pressed and the must fermented for white wine. The temperature of the must at starting was 66°, and the maximum reached was 87°, on the second day. The wine was dry on the fourth day, and on the tenth was racked.

In three weeks the wine was nearly clear, fresh, and clean-tasting. At four months it was a passable wine, without character, but with no defect except a slight bitterness. At five months it was racked for the third time; it was much improved, very smooth, and clean-tasting. At twelve months it had not changed much; it had developed a little bouquet, and was in good condition. The acid was rather low, and a blend with two-fifths Burger (No. 1908) made a great improvement.

No. 2050. *Cinsaut*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were over medium in size, long-conical, well filled; the berries large, oval, juicy, mature, well colored. The must showed 19.1 % of solid contents by spindle and 0.61 % of acid.

GRENACHE.

(See Vit. Rept. 1883-85, p. 107; 1887-89, p. 206.)

The Grenache is characterized in most localities by vigorous growth and abundant foliage, and when not injured by mildew or coulure it is a heavy bearer. When pruned short in the ordinary way it is apt to shade its grapes too much; and, especially in moist seasons, if not well sulphured, is very subject to mildew. In Santa Clara, Alameda, and San Diego counties it is reported as being very subject to coulure. At Fresno it bears well and develops high sugar and medium acid; the average of five analyses is, sugar 25.9% and acid 0.45%.

At Tulare the vine is a strong grower and bears from six to ten tons per acre in the somewhat alkaline, sandy soil in which it is planted. The composition of the must has been good and fairly constant, varying little from the average of 23.5% of sugar and 0.50% of acid shown by four analyses. It ferments well, but makes a neutral wine almost totally lacking in color, with little quality, and much inferior to that of Refosco from the same vineyard. Its chief merits are vigor and heavy bearing, and in the latter, at least, it is surpassed by the Petit Bouschet, a much preferable grape.

At Paso Robles the composition of the must is practically the same as at Tulare as regards sugar and acid, but it makes a wine of somewhat better quality, though still lacking in color and quality.

At the Amador station the vine is a strong grower and good bearer, but somewhat inclined to coulure.

One of the disadvantages of the wine of this grape is the peculiar "burnt-sugar" flavor which it carries into all blends not strongly flavored otherwise, and which is not generally liked.

Analyses of Musts and Wines.

GRENACHE.			MUST.					WINE.						
			Date of Picking	Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol.		Tannin	Total Acid as Tartaric.		Body
								By Weight	By Volume		At Pressing.	At Six Months.	
1890	No. 1249.	Fresno	Aug. 25	24.10	23.72	.57	.40	9.70	12.09	.153	.55	.46	3.02
	No. 1333.	Cupertino	Oct. 11	24.35		.62							
1891	No. 1444.	Tulare	Aug. 26	22.60		.53							
	No. 1527.	Paso Robles	Oct. 5	24.40	24.12	.45		9.70	12.09	.180		.40	2.55
1892	No. 1626.	Tulare	Sept. 3	23.25	23.13	.47	.35	9.41	11.73	.172	.55	.48	2.90
	No. 1721.	Paso Robles	Oct. 10	22.60	22.23	.56	.45	9.05	11.27	.146	.50	.55	2.85
1893	No. 1822.	Amador station	Sept. 7	23.25		.74				.288	.80		
	No. 1845.	Tulare	Sept. 14	22.80	20.61	.53	.33	8.84	11.00	.109	.52		2.70
	No. 2010.	Paso Robles	Oct. 26	28.20	27.65	.51	.29	11.08	13.54	.224	.51	.60	2.85
1894	No. 2170.	Tulare	Sept. 24	25.10	24.97	.47		10.44	12.91	.150	.40	.44	2.85
	No. 2193.	Amador station	Sept. 25	28.00		.46							

Color Readings.

	GRENACHE.		At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.	Six Months.
1891	No. 1527.	Paso Robles	18.0 R+1R	9.3 1R	4.0 2R+Y				
1892	No. 1626.	Tulare	20.0 2R	10.5 1VR+Y	10.0 1VR+Y	9.3 3VR+Y	6.3 3R+Y		5.7 3R+Y
	No. 1721.	Paso Robles	28.8 2VR	18.1 5VR	14.3 R	11.1 R	9.1 R	7.8 R	
1893	No. 1822.	Amador station	22.0 5VR						
	No. 1845.	Tulare	3.8 2R+2Y						
	No. 2010.	Paso Robles	24.4 3VR	10.4 1R	9.6 1R	10.2 1R	10.0 R		
1894	No. 2170.	Tulare	Color too light and too yellow to be read on the scale.						

RECORD OF TREATMENT.

No. 1249. *Grenache*, from Margherita Vineyard, Fresno. Received August 27, 1890, in good condition, and mature. The must showed 24.1% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the maximum reached was 78°, at which temperature it remained during the fourth and fifth days. The fermentation was slow in starting and tardy in finishing; the murk was drawn off on the seventh day while still sweet, and the fermentation continued in the cask; six days after pressing the wine was quite dry.

At ten weeks the wine was of fair quality and bright, the color was light, and the wine had little flavor or aroma, but was clean-tasting and with good acid and tannin. A month later the wine was racked for the second time, and soon after an examination of the lees showed the presence of a little lactic ferment, but the taste was unaffected, and the wine, having developed a little bouquet, had improved generally. It was pasteurized for safety. After this the wine did not improve much, but remained bright, and a coarse but drinkable wine. At eighteen months it was mature, and was bottled. At three years the bottled wine was tasted; that bottled at eighteen months was in good condition, but had lost nearly all its red color and was of deep straw color; it was without any positive defect, but lacked freshness and character. Some of the wine bottled earlier had retained some color, but had not kept well.

No. 1333. *Grenache*, from J. T. Doyle, Cupertino. Received October 13, 1890, in good condition, and mature. The must showed 24.35% of solid contents by spindle and 0.62% of acid.

No. 1444. *Grenache*, from Tulare station. A sample for must analysis was received August 29, 1891, in good condition. The must showed 22.6% of solid contents by spindle and 0.53% of acid.

No. 1527. *Grenache*, from Paso Robles station. Received October 7, 1891, in good condition. The must showed 24.4% of solid contents by spindle and 0.45% of acid. The grapes were fermented with No. 1528, Mourastel, from the same vineyard. The temperature of the grapes was 64° at crushing, and reached a maximum of 86° on the third day. On the fifth day the murk was nearly dry, and was drawn off.

At one month from pressing the wine was clear, had a little aroma and flavor, was smooth, but tasted a little flat. During the first three months the wine was racked twice; the lees were examined and found to be sound. At five months the wine was clear and sound, but flat, characterless, and of poor quality. It was racked three times during the next twelve months, and remained clear, but improved very little in quality. At fifteen months it was bottled. The wine improved considerably in bottle, and at three and a half years was a fair wine, but rather thin, and lacking in color and flavor.

No. 1626. *Grenache*, from Tulare station. Received September 6, 1892, in fair condition. The must showed 23.25% of solid contents by spindle and 0.47% of acid. The temperature of the must at crushing was 68°, and the maximum reached was 99°, on the fourth day. On the sixth day the murk was nearly dry, and was racked off.

At one month the wine was nearly clear, very promising, but still a little sweet. Two weeks later it was clear and nearly dry. At four months it was clear, but still slightly sweet, and not quite clean-tasting. An examination of the lees showed the presence of filaments, and the wine was pasteurized. Two months after pasteurizing it was racked, and was bright and nearly dry, but of poor quality. After this it gradually improved, and remained bright and sound. At nineteen months it was bottled.

No. 1721. *Grenache*, from Paso Robles station. Received October 13, 1892, in good condition; the grapes were small and tasteless. The must showed 22.6% of solid contents by spindle and 0.56% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 82°, on the third day. On the fourth day the murk was nearly dry, and was drawn off.

At one month the wine was racked, being nearly clear, dry, and promising. At three months it was bright, smooth, and pleasing, with moderate acid and astringency. Successive tastings at five, eight, and fourteen months showed a gradual improvement; it kept well, and was sound and pleasant, but lacked character. At eighteen months it was mature, and was bottled.

No. 1822. *Grenache*, from Amador station. Received September 8, 1893, in good condition. The bunches and berries were of fair size, lacking in color and not quite mature. Only a sample for must analysis was received. The must showed 23.25% of solid contents by spindle and 0.74% of acid.

No. 1845. *Grenache*, from Tulare station. Received September 14, 1893, in good condition, and mature. The bunches were of medium size, from well filled to compact, the skin very tough and thick, with very little color. The must showed 22.8% of solid contents by spindle and 0.53% of acid. The temperature of the must at crushing was 68°, and the maximum reached was 93°, on the third day. On the fifth day the murk was nearly dry, and was drawn off.

The wine fermented for some time and remained cloudy, but at the end of a month was nearly clear, and clean-tasting. At five months it was bright, a little sweet, with little bouquet or flavor, but clean-tasting, and was racked for the second time. After

this it improved, remaining sound and agreeable. At eleven months it was in good order and had rather more character than the Carignane of the same year and locality (No. 1887), but no more color.

No. 2010. *Grenache*, from Paso Robles station. Received October 26, 1893, in good condition. The bunches were over medium in size, short, cylindrical, from well filled to compact, on very thick peduncles; the berries were of medium size, nearly round, firm, very sweet, and some dried. The must showed 28.2% of solid contents by spindle and 0.51% of acid. The temperature of the grapes at crushing was 62°, and the maximum of 77° was reached on the fifth day. On the fifth day the murk was nearly dry, and was drawn off.

In two weeks the wine was nearly clear, but still a little sweet. It was racked, taken to the cellar, and at two months was quite clear, of good, medium acid and astringency, some flavor, sub-sweet, but sound. At six months it was smooth and agreeable, without much character, but sound and in good order. At nine months it had improved in flavor, but had suffered from the smallness of the sample.

PLOUSSARD.

(See Vit. Rept. 1885-86, p. 82; 1887-89, p. 220.)

The Ploussard has unfortunately only been tested at the Bay region stations. It has proved but a moderate bearer, even with long-pruning, doing the better, in this respect, at Mission San José, of the two stations tried. It has shown some good qualities, but has by no means sustained its French reputation. It makes an alcoholic wine with low to medium acid, deficient astringency, and good body. The color is at first fair, but it quickly falls and turns yellow. The wine develops very quickly, and is at first very agreeable, but is a poor keeper and quickly deteriorates. It might be useful as a blend to give some of its delicacy to coarser varieties, but it ripens one or two weeks before any of the varieties with which it would make appropriate blends. It is an extremely delicious table-grape, and would be useful as an early red eating-grape for consumption near the vineyard, but it is too delicate to bear shipment.

Analyses of Musts and Wines.

PLOUSSARD.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At Six Months	Body
1890—No. 1261. Mission San José	Sept. 24	24.80	.....	.55	.34	9.78	12.18	.115	.46	.41	2.95
No. 1291. Cupertino	Oct. 1	25.10	.....	.57	.21	.....	.....	.....	.....	.....	.....
1891—No. 1505. Mission San José	Sept. 24	25.30	25.41	.45	.....	10.16	12.64	.188	.41	.42	3.05
1892—No. 1637. Mission San José	Sept. 10	22.00	.....	.57	.....	.....	.....	.....	.....	.....	.....
1893—No. 1983. Mission San José	Oct. 19	25.90	24.75	.56	.....	10.81	13.27	.182	.58	.61	2.80

Color Readings.

PLOUSSARD.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1891—No. 1505—Mission San José	13.65 2R	14.3 1VR+Y	13.9 4VR+Y	9.4 3R+Y	9.0 3R+Y	9.6 3R+YY
1893—No. 1983—Mission San José	29.80 5VR	13.7 2R	13.4 3R	11.8 3R	8.2 (Y)	.....

RECORD OF TREATMENT.

No. 1261. *Ploussard*, from Mission San José. Received September 27, 1890, in fair condition, and mature. The must showed 24.8% of solid contents by spindle and 0.55% of acid. The temperature of the must at crushing was 67°, and the maximum reached was 85°, on the fourth day. On the fifth day the murk was drawn off while still a little sweet.

The wine remained cloudy for some time, but at one month it was dry and nearly clear. At two months it was clear, very poor in color, of medium acid and astringency, showing a good flavor somewhat masked by the taste of moldy grapes. At three months it was considerably improved and developed, but as the taste was a little suspicious it was pasteurized. After this it remained bright and lost its moldy taste; it was in a small keg and developed very quickly. At seven months it had some bouquet and was very smooth and agreeable. After this it deteriorated and lost the little color it had to start with. At sixteen months it was bottled, but tasted somewhat thin and exhausted. It did not improve in bottle, but soon became decrepit.

No. 1291. *Ploussard*, from Cupertino. A sample for must analysis was received October 3, 1890, in bad condition, much bruised, and quite mature. The must showed 25.1% of solid contents by spindle and 0.57% of acid.

No. 1505. *Ploussard*, from Mission San José. Received September 27, 1891, in fair condition, a few grapes moldy. The must showed 25.3% of solid contents by spindle and 0.45% of acid. The temperature of the must at crushing was 67°, and the maximum reached was 92°, on the third day. The murk was drawn off on the fourth day, while still a little sweet.

At one month the wine was dry, nearly clear, but tasted flat. An examination of the lees showed the presence of a few filaments, and the wine was pasteurized. At six months it was bright, very light in color, with good body and alcohol, generally improved, and of fair quality. At sixteen months it had been racked three times and was in good order; and, being of fair quality and mature, it was bottled. At three years and a half the bottled wine was bright, with fair but yellowish color, of good flavor, but the bouquet injured by the presence of a little volatile acid.

No. 1637. *Ploussard*, from Mission San José. Received September 13, 1892, in fair condition. The must showed 22.0% of solid contents by spindle and 0.57% of acid. No wine was made.

No. 1983. *Ploussard*, from Mission San José. Received October 19, 1893, in good condition. The bunches were small to medium, loose, and winged; the berries were variable in size, ellipsoidal, and thin-skinned. The sample was very ripe, and many of the grapes dried. The must showed 25.9% of solid contents by spindle and 0.56% of acid. The temperature of the must at crushing was 62°, and the maximum reached, on the fifth day, was 92°. On the sixth day the wine was nearly dry, and was drawn off.

At one month the wine was nearly clear, and was racked and taken to the cellar. At three months it was clear, clean-tasting, with good flavor and some bouquet, good acid and astringency, but was still slightly sweet. During the spring the wine did not taste so well, but became quite dry, and at nine months had improved, was bright, and in good order; generally a good wine, but very poor in color. At this time an examination of the lees showed them to be perfectly sound.

TROUSSEAU.

(See Vit. Rept. 1885-86, p. 82; 1887-89, p. 201.)

Further experiments with the Trousseau show that it will make a fair Port in those localities where a Port is a possibility, but that for other purposes it is more or less a failure. For a dry red wine, without the aid of some other grape, it is quite useless, lacking sufficient color, acid, or tannin. An attempt to make it up into a white wine was little more successful. A sample of Trousseau from Asti, Sonoma County, with full sugar contents and medium acid, was made into white wine, which was rough, coarse, and totally lacking in the freshness which should characterize a white wine, but with better keeping qualities than this variety has when fermented on the skins. Wherever grown, if grown at all, it should be blended in the vat with some grape possessing sufficient acid to insure healthy fermentation.

Analyses of Musts and Wines.

TROUSSEAU.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body	WINE. Sugar
1890—No. 1204. Fresno	Aug. 12	22.27	22.05	.58	.52	8.84	11.00	.084	.47	.43	2.60	------
1891—No. 1458. Fresno	Aug. 28	27.65	------	.61	------	*15.67	19.28	.160	.56	.20	*6.85	------
No. 1498. Asti, Sonoma County	Sept. 14	24.60	23.13	.41	.39	9.78	12.18	.065	------	.47	2.70	------
No. 1510. Mission San José	Sept. 25	25.20	26.31	.53	------	*14.64	18.03	.200	.40	.26	*3.03	2.07
1893—No. 1925. Paso Robles	Oct. 12	26.90	26.12	.26	.34	------	------	.176	.38	------	------	------
1894—No. 2335. Tulare	Oct. 19	26.80	------	.30	------	------	------	------	------	------	------	------

*Fortified.

Color Readings.

TROUSSEAU.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.
1891—No. 1458. Fresno	5.1 1VR+2Y	3.7 3VR+2Y	------	------	------
No. 1510. Mission San José	20.0 1R	9.3 2R+1Y	8.2 1VR+2Y	10.4 1VR+2Y	8.0 1R+2Y
1893—No. 1925. Paso Robles	10.9 1VR+1Y	------	------	------	------

RECORD OF TREATMENT.

No. 1204. *Trousseau*, from Margherita Vineyard, Fresno. Received August 14, 1890, in good condition, but for some moldy bunches. The bunches were of good size for the variety, and well filled; the skin with very little color, and the grapes generally not quite ripe, some of the bunches being quite green. The must showed 22.27% of solid contents by spindle and 0.58% of acid. The temperature of the must at crushing was 69°, and the maximum reached was 86°, on the fourth day. On the sixth day the murk was dry, and was drawn off.

The wine was almost without color and of poor quality, and at three months began to develop a suspicious taste. An examination of the lees showed long filaments, so the wine was pasteurized. After this it became bright, but did not otherwise improve.

No. 1458. *Trousseau*, from Fresno. Received August 31, 1891, in good condition, but slightly dried. The must showed 27.6% of solid contents by spindle and 0.61% of acid. The temperature of the grapes at crushing was 76°, and the maximum reached was 86°, on the third day. On the fourth day the murk was drawn off while still sweet; it fermented slowly in cask for ten days longer, when it was fortified. The wine did not keep well and acquired a bad taste.

No. 1498. *Trousseau*, from Asti, Sonoma County. Received September 17, 1891, in good condition, except for a few moldy bunches. The must showed 24.6% of solid contents by spindle and 0.41% of acid. The grapes were pressed and the must fermented for white wine. The temperature of the must at crushing was 69°, and the maximum reached was 78°, on the third day. It was dry on the seventh day, when it was racked from the lees.

At three weeks the wine was nearly clear and quite dry. At two months it was clear, with little aroma, smooth and pleasing, but without much character and with a slight schiller tint. A month later the lees showed a few filaments and the taste had become very slightly affected; the wine was therefore pasteurized. At six months it had developed some bouquet, but was flat and not of high promise. At nine months it had improved somewhat, and was smooth, oily, full-bodied, but with little character and none of the freshness of a good white wine. After this it was racked twice and was bottled at sixteen months, bright and sound, but coarse and of poor quality. At three and a half years the bottled wine was rough, coarse, and showed that it had been bottled too soon.

No. 1510. *Trousseau*, from Mission San José. Received September 27, 1891, in poor condition, many of the grapes moldy. The must showed 25.2% of solid contents by spindle and 0.53% of acid. The temperature of the grapes at crushing was 67°, and the maximum of 86° was reached on the second day. The murk was drawn off and fortified on the third day.

The wine soon cleared and was of good flavor, but rather too dry. It gradually improved, and at three and a half years was a light-colored, brownish Port, with full, agreeable bouquet and clean taste. On account of the smallness of the sample (three and a half gallons) it matured quickly, and by concentration, due to evaporation, became quite sweet enough. It was rather light in body, but otherwise a good Port.

No. 1925. *Trousseau*, from Paso Robles station. Received October 12, 1893, in good condition, but overripe and many berries dried. The bunches were of medium size, very compact and regular; the berries small, with little juice. The must showed 26.9% of solid contents by spindle and 0.26% of acid. Only a sample for must analysis was received.

BASTARDO.

(See Vit. Rept. 1883–85, p. 119; 1887–89, p. 256.)

There is little to be added to former reports on this variety; as a producer of dry red wine it may be said to be a failure. Its high sugar contents, together with its moderate or low acid, make it a difficult wine to ferment, and a poor keeper. The average composition of the must has been: at Cupertino, 25.6% of sugar, 0.46% of acid; at Mission San José, 25.8% of sugar, 0.55% of acid; at Tulare, 25.7% of sugar, 0.41% of acid. At Paso Robles the sugar content has been lower and the acid higher than these figures, but this is probably in part owing to the youth of the vines. The best use that can be made of this variety is in the manufacture of Ports with the aid of other grapes. At Tulare the vine is a fairly good grower where the alkali is not too strong, but a poor bearer and liable to sunburn.

Analyses of Musts and Wines.

BASTARDO.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months.	WINE. Body
1890—No. 1354. Cupertino	Oct. 12	25.77	.....	.41	.....	.....	.....	.....	.....	.....	.....
1891—No. 1479. Paso Robles	Sept. 1	22.90	.....	.43	.....	.....	.....	.....	.....	.....	.....
1892—No. 1625. Tulare	Aug. 28	24.80	.....	.41	.....	.....	.....	.....	.....	.....	.....
No. 1641. Paso Robles	Sept. 13	22.15	.....	.64	.....	.....	.....	.....	.....	.....	.....
No. 1709. Mission San José	Oct. 3	23.70	22.95	.85	.26	9.78	12.18	.262	.53	.39	3.15
1893—No. 1834. Amador station	Sept. 7	24.80	.....	.72	.....	.....	.....	.358	.68	.....	.....
No. 1865. Paso Robles	Sept. 15	23.90	22.95	.49	.34	9.30	11.48	.151	.38	.40	2.80
No. 2047. Cupertino	Nov. 1	28.00	.....	.63	.....	.....	.....	.252	.75	.....	.....
1894—No. 2149. Tulare	Sept. 17	26.50	.....	.41	.....	.....	.....	.....	.....	.....	.....
No. 2266. Mission San José	Oct. 5	25.90	.....	.47	.....	.....	.....	.....	.....	.....	.....

Color Readings.

BASTARDO.	At Pressing.		One Month.		Two Months.		Three Months.		Four Months.		Five Months.	
1892—No. 1709. Mission San José	81.7	VR	40.0	4VR	37.0	5VR	26.8	R	23.8	R	20.8	R
1893—No. 1834. Amador station	14.9	2R	12.4	3R	.....	.....	.....	.....	.....	.....	.....	.....
No. 1865. Paso Robles	10.0	2VR+Y	6.7	VR+Y	5.0	VR+Y	.....	.....	.....	.....	.....	.....
No. 2047. Cupertino	18.2	4VR	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1354. *Bastardo*, from Cupertino. Received October 13, 1890. The must showed 25.77% of solid contents by spindle and 0.44% of acid.

No. 1479. *Bastardo*, from Paso Robles station. A sample for must analysis was received September 3, 1891, in good condition; small, well-filled bunches of small grapes, mature. The must showed 22.9% of solid contents by spindle and 0.43% of acid.

No. 1625. *Bastardo*, from Tulare station. A sample for must analysis was received September 1, 1892, in good condition. The must showed 24.8% of solid contents by spindle and 0.41% of acid.

No. 1641. *Bastardo*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 22.15% of solid contents by spindle and 0.64% of acid.

No. 1709. *Bastardo*, from Mission San José. Arrived October 5, 1892, in fair condition. The must showed 23.7% of solid contents by spindle and 0.85% of acid. The grapes were fermented with No. 1700, Teinturier mâle, from the same vineyard. The temperature of the grapes at crushing was 68°, and the maximum of 97° was reached on the fourth day. On the fifth day the murk was nearly dry, and was pressed.

Three weeks after pressing the wine was clear and dry, but not of high promise. At one month it was racked and taken to the cellar. At two months it was bright, with full, good bouquet and flavor, but not clean-tasting; at this time the wine was of good quality, but was evidently not going to keep well. At four months it had acquired a slight bitterness, but was otherwise little changed. After this, though the wine remained bright and no injurious germs could be found in the lees, it became gradually flat and insipid, till at about fourteen months it was no longer worth keeping.

No. 1834. *Bastardo*, from Amador station. A sample for must analysis was received September 8, 1893, in good condition; the bunches were small and the berries slightly shriveled. The must showed 24.8% of solid contents by spindle and 0.72% of acid.

No. 1865. *Bastardo*, from Paso Robles station. Received September 15, 1893, in good condition; bunches small, compact, without coulure, and evenly ripened. The must showed 23.9% of solid contents by spindle and 0.49% of acid. The temperature of the grapes at crushing was 67°, and the maximum of 85° was reached on the third day. The wine was dry on the fifth day, when it was pressed.

The wine remained cloudy for some time, and continued an almost insensible fermentation. It was racked at one month and again at four months, but, though it became clear, it was flat and insipid. After this it changed little, and at one year it was drinkable, but not a good wine. The lees showed a few filaments.

No. 2047. *Bastardo*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were of medium size, long conico-cylindrical, close; the berries of medium size, oval, firm, fleshy, very sweet, and just commencing to dry up. The must showed 28.0% of solid contents by spindle and 0.63% of acid.

CHAUCHÉ NOIR.

(See Vit. Rept. 1885–86, p. 79; 1887–89, p. 112.)

This variety resembles the Pinots in its yellowish color and its liability to attacks by secondary fermentations, without having the delicacy of flavor which characterizes the latter. Though unsuited to be used alone, a fair wine can be made of it if the grapes are fermented with, say one third of some robust and tannic wine, such as the Tannat or some of the Italian varieties. It ripens much earlier than the latter, and would have to be blended during the after-fermentation. It cannot, however, be recommended for planting in any locality in California where it has yet been tried.

Analyses of Musts and Wines.

CHAUCHÉ NOIR.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing.	WINE. Total Acid as Tartaric. At Six Months.	WINE. Body
1890—No. 1227. Fresno	Aug. 23	28.40	28.62	.34	.59						
No. 1290. Cupertino	Oct. 1	25.00		.55							
No. 1298. Mission San José	Oct. 5	26.30		.53	.39	10.81	13.27			.32	2.45
1891—No. 1446. Tulare	Aug. 26	26.90		.46							
No. 1557. Paso Robles	Oct. 6	22.15		.82							
1892—No. 1652. Paso Robles	Sept. 13	19.25		1.71							
No. 1685.* Mission San José	Sept. 24	24.10		.64		9.70	12.09	.189	.53	.48	3.10
1893—No. 1795. Tulare	Aug. 31	22.80	21.38	.68	.60	8.48	10.58		.56		3.80
No. 1832. Amador station	Sept. 7	25.00		.68				.362	.67		
No. 1868. Paso Robles	Sept. 15	21.95	20.99	.92		8.34	10.42	.112	.45	.56	3.10
No. 2075. Mission San José	Nov. 3	29.10		.47		11.62	14.20	.173	.54	.40	3.10
No. 2109. Cupertino	Nov. 1	30.90		.65				.307			
1894—No. 2150. Tulare	Sept. 17	28.40		.45							

Color Readings.

CHAUCHÉ NOIR.	At Pressing.		One Month.		Two Months.		Three Months.		Four Months.		Five Months.	
1891—No. 1685.* Mission San José	50.0	1VR	33.3	4VR	16.6	R	17.4	R	14.8	R	14.8	R–1R
1893—No. 1832. Amador station	18.9	3R	10.9	(Y)								
No. 1868. Paso Robles	17.2	4VR	7.3	1R	5.9	2R	5.6	1R	5.8	3R	4.6	3R
No. 2075. Mission San José	26.8	4VR	17.0	R	15.4	R	13.1	R–1R	4.0	(Y)		
No. 2109. Cupertino	22.7	4VR										

* Blend of Chauché noir 73% and Tannat 27%.

RECORD OF TREATMENT.

No. 1227. *Chauché noir*, from Fresno. A sample for must analysis was received August 25, 1890, in fair condition—over-mature and some berries dried. The must showed 28.4 % of solid contents by spindle and 0.34 % of acid.

No. 1290. *Chauché noir*, from Cupertino. A sample for must analysis was received October 3, 1890, in fair condition, quite ripe. The must showed 25.0 % of solid contents by spindle and 0.55 % of acid.

No. 1298. *Chauché noir*, from Mission San José. Received October 7, 1890, in bad condition—much crushed and moldy. The must showed 26.3 % of solid contents by spindle and 0.53 % of acid. The grapes were crushed and fermented as white wine. The temperature at crushing was 67°, and the maximum reached, on the third day, was 83°.

The wine was dry on the tenth day and was racked from the lees. At one month the wine was clear, of light schiller color, smooth, with low acid and high alcohol, but the quality quite spoiled by the taste of mold. At six weeks the lees were not well settled, but seemed sound. At two months the wine was racked for the second time, and at three months the lees were examined again and found to contain some filaments, so the wine was pasteurized. It was clear and had improved somewhat. At seven months it was bright, but still showed the effects of the moldy grapes, and had acquired a Sherry taste. It was racked for the fourth time, and at fourteen months was clear and sound, but showed little improvement in taste. At seventeen months it was bottled, but did not keep well.

No. 1446. *Chauché noir*, from Tulare station. A sample for must analysis was received August 29, 1891, in good condition. The must showed 26.9 % of solid contents by spindle and 0.46 % of acid.

No. 1557. *Chauché noir*, from Paso Robles station. A sample for must analysis was received October 8, 1891, in good condition. The bunches were medium sized, well filled; the berries small and mature. The must showed 22.15 % of solid contents by spindle and 0.82 % of acid.

No. 1652. *Chauché noir*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 19.25 % of solid contents by spindle and 1.71 % of acid.

No. 1685. *Chauché noir*, from Mission San José. Received September 27, 1892, in good condition. The must showed 24.1 % of solid contents by spindle and 0.64 % of acid. The grapes were fermented with No. 1686 in the proportion of 149 lbs. of Chauché noir to 54.5 lbs. of Tannat. The temperature of the grapes at crushing was 67°, and the maximum reached on the fourth day was 96°. In four days and a half the wine was dry, and was drawn off.

In one month the wine was nearly clear, and was racked off and taken to the cellar. At three months it was bright, with some flavor and aroma, medium acid and astringency—a drinkable wine, but not of high quality, and slightly bitter. The lees were sound, and two months later the wine was in good condition and still possessed of a faint sweetness. It was racked for the second time, and a month later the lees showed much *S. ellipsoideus* and a few short filaments. The wine remained, however, in good order, and improved. Tastings at eight, ten, and fourteen months showed a gradual improvement, and at the end of that time it was of good quality and very smooth. It was bottled at eighteen months.

No. 1795. *Chauché noir*, from Tulare station. Received August 31, 1893, in bad condition. The bunches were of the usual size, but the berries were larger; they were flavorless and with little color. The must showed 22.8 % of solid contents by spindle and 0.68 % of acid. There were 205 lbs. crushed. The temperature of the must at crushing was 63°, and the maximum reached, on the fifth day, was 85°.

The wine was taken off the lees at two weeks, and at one month was nearly clear, and was racked again and taken to the cellar. At five months it was clear, but flat and of poor quality, and was racked for the third time. After this the wine deteriorated, and at one year was quite spoiled.

No. 1832. *Chauché noir*, from Amador station. A sample for must analysis was received September 8, 1893, in good condition. Both bunches and berries were very small, and the berries rounder than usual. The must showed 25.0 % of solid contents by spindle and 0.68 % of acid.

No. 1868. *Chauché noir*, from Paso Robles station. Received September 15, 1893, in good condition. The bunches were of good size, compact; the berries of average size, mature. The must showed 21.9 % of solid contents by spindle and 0.92 % of acid. There were 88 lbs. crushed at a temperature of 67°. The maximum temperature reached was 86°, on the fourth day. On the fifth day the wine was dry, and was drawn off.

At three weeks the wine was nearly clear, but of poor quality. It was racked and taken to the cellar, and at four months was clear, much improved, but lacking in color and character. At five months it was racked again, and at eight months it had changed little, was sound, but somewhat green. At eleven months the wine was in good order, sound, of fair quality; had deposited no lees, but did not taste mature. At twelve months it was bottled.

No. 2075. *Chauché noir*, from Mission San José. Received November 3, 1893, in good condition. The bunches were small, conico-cylindrical, with a small wing, close; the berries small, oval, firm, and crisp, very sweet, and overripe. The must showed 29.1% of solid contents by spindle and 0.47% of acid. The 95 lbs. crushed were fermented as red wine, started at a temperature of 63°, and reached a maximum of 88° on the third day. On the fifth day the wine was nearly dry, and was drawn off.

At one month, when it was racked and taken to the cellar, the wine was clear, but still a little sweet. At three months it was not quite clear, faintly sweet, with bitter after-taste, but of good flavor. After this it became still more bitter and generally deteriorated.

No. 2109. *Chauché noir*, from Cupertino. A sample for must analysis was received November 3, 1893, in good condition. The bunches were small, conico-cylindrical, well filled; the berries small, oval, pulpy, very ripe, but with good acid. The must showed 30.9% of solid contents by spindle and 0.65% of acid.

DOLCETTO.

Synonyms: Uva d'Aqui; Dolutz nero.

Description.—Vine rather vigorous and very productive, with short-jointed canes and prominent buds; young leaves of an intense vinous red, covered with a light, whitish down; tendrils, petioles, and nerves of leaves reddish; leaves rather large, and wider than long; bunch large, pyramidal, regular, winged, and well filled; berries bluish-black, round, and thin-skinned.

This variety is cultivated in the north of Italy, principally near Alba and Acqui, and especially on the higher slopes of the Alps and the high valleys of the Apennines. It is valued on account of its early ripening and heavy bearing. It makes a light, very smooth wine, which can be consumed early, on account of its quick development. It lacks the asperity which is so characteristic of most of the red wines of northern Italy when they are young, but it never attains the high quality of the Nebbiolo or Bonarda. The Dolcetto is prized also on account of its good color. In this respect, however, it has not retained its reputation in California. It will be a useful grape to plant for smooth, light, quickly maturing wines, where fair quality and large quantity are desired. It is an excellent table-grape, on account of its fine appearance, agreeable flavor, and early ripening, but is not tough enough for long shipments.

ANALYSES OF MUSTS AND WINES.

DOLCETTO.	Date of Picking.	MUST.				WINE.					Body
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol. By Volume.	Alcohol. By Weight.	Tannin.	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At 6 Months.	
1890—No. 1348. Cupertino..	Oct. 13	19.50	.....	.80	....	.....	.....	.....	....	....	....
1891—No. 1572. Asti, Sonoma Co....	Oct. 8	*27.45	27.65	.31	.30	10.91	13.36	.210	.62	.44	2.60
1893—No. 2111. Cupertino..	Nov. 5	26.90	.....	.58	....	.....	.....	.259	....	....	....

* Water and tartaric acid were added to the must.

RECORD OF TREATMENT.

No. 1348. *Dolcetto* (Menlo No. 1), from J. T. Doyle, Cupertino. Received October 13, 1890, in fair condition, some of the bunches being moldy. The bunches were of medium size, conico-cylindrical, sometimes winged, not compacted; the berries over average in size, round, reddish-brown in color, with thin skin and soft, rather juicy flesh; peduncle

short and green. The grapes resemble the true Dolcetto very closely, except in their lack of color. The must showed 19.5% of solid contents by spindle and 0.80% of acid. No wine was made.

No. 1572. *Dolcetto*, from Asti, Sonoma County. Received October 10, 1891, in fair condition, over-mature, very sweet, and many grapes half dried. The must showed 27.45% of solid contents by spindle and 0.31% of acid. The grapes (119 lbs.) were crushed at a temperature of 61°. On the second day 1.2 gallons of water and 83.5 grams of tartaric acid were added. The maximum temperature of 87° was reached on the fourth day. On the seventh day, when the wine was drawn off, it was nearly dry.

At one month the wine was bright, had light, delicate aroma, full flavor, clean taste, good astringency, and medium acid. It was racked, and at four months the lees showed a little "graisse," but the wine was bright, little changed, and tasted quite sound. A month later it was racked again. It was very smooth and pleasing, full-bodied, and clean-tasting; it was of excellent quality and was maturing quickly. At ten months it was racked again. At sixteen months it retained its good quality, but had not developed much bouquet. At this date it was racked and part put in bottle At twenty-two months, when the rest of the wine was bottled, it had improved and kept perfectly. At three years and three months the bottled wine was bright, of light color, somewhat deficient in bouquet, but very agreeable and smooth—an excellent wine of Burgundy type.

No. 2111. *Dolcetto*, from J. T. Doyle, Cupertino. A sample for must analysis was received November 7, 1893, in good condition. The bunches were large, irregular, conical, compact, shouldered; the berries large, round, pulpy, very sweet, and with a delicate sub-Muscat flavor. It differed from Mas and Pulliat's description of this variety in the compactness of the bunches, the pulpy nature of the berries, and the marked flavor. The must showed 26.9% of solid contents by spindle and 0.58% of acid.

CARIGNANE.

(See Vit. Rept. 1883–85, p. 92; 1885–87, p. 74; 1887–89, p. 171.)

The results obtained with this grape in different localities of California are somewhat discordant. In a few specially suitable localities it has produced a good wine, while in most others the wine is only from fair to poor. The best results have been obtained on well-drained soils in parts of the Santa Clara Valley and the upper Russian River Valley. In moist, rich soils the vines are very much subject to mildew, and require frequent sulphuring. The must generally possesses sufficient sugar and from medium to high acid. The wine is full-bodied, with medium to low astringency. In favorable localities it has sufficient color, but of a somewhat yellowish cast.

At Tulare and Fresno the Carignane is a thrifty, upright grower, a heavy bearer, and does well in fairly strong alkali. The must is rather low in sugar, with fair acid. It makes a good, neutral wine, lacking in color and tannin, but superior to that of Grenache or Cinsaut from the same place.

ANALYSES OF MUSTS AND WINES.

CARIGNANE.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	Body	Sugar
1890—No. 1251. Fresno	Aug. 25	20.60	19.89	.74	.41	8.91	11.09	.125	.56	.48	2.36	.....
No. 1335. Cupertino	Oct. 11	21.50	.....	.72	.....	.....	.....	.....	.....	.....	.....	.....
No. 1409. Mission San José	Oct. 19	24.80	.....	.95	.33	10.16	12.64	.213	.65	.66	3.08	.32
(*a*) Closed vat	.....	24.80	.....	.95	.27	10.63	13.09	.199	.....	.54	2.82	.26
(*b*) With calcium sulphate	.....	24.80	.....	.95	.45	10.44	12.91	.213	.....	.62	3.94	.28
(*c*) With calcium phosphate	.....	24.80	.....	.95	.40	9.78	12.18	.180	.....	.56	3.22	.26
(*d*) With ammonium phosphate	.....	24.80	.....	.95	.39	9.92	12.36	.217	.....	.48	3.82	.22
1891—No. 1447. Tulare	Aug. 26	21.70	.....	.44	.....	.....	.....	.....	.....	.....	.....	.....
No. 1525. Asti, Sonoma County	Oct. 6	24.40	23.61	.48	.33	10.00	12.54	.240	.57	.48	2.78	.....
No. 1576. Paso Robles	Oct. 10	19.70	17.44	.67	.35	7.23	9.00	.123	.63	.48	2.60	.....
1892—No. 1628. Tulare	Sept. 3	21.50	18.89	.59	.38	8.34	10.42	.143	.54	.56	3.30	.....
No. 1742. Paso Robles	Oct. 11	24.80	.....	.35	.....	.....	.....	.....	.....	.....	.....	.....
No. 1791. Mission San José	Oct. 21	20.60	.....	.99	.....	8.27	10.36	.209	.....	.78	3.00	.....
1893—No. 1871. Amador station	Sept. 12	23.30	20.61	.90	.22	.....	.....	.400	.....	.....	.....	.....
No. 1887. Tulare	Sept. 22	20.60	18.90	.71	.26	7.92	9.90	.070	.56	.53	2.60	.....
No. 2081. Paso Robles	Nov. 4	25.90	24.12	.51	.34	9.78	12.18	.154	.47	.48	3.30	.....
1894—No. 2173. Amador station	Sept. 24	22.60	.....	.68	.....	.....	.....	.....	.....	.....	.....	.....
No. 2210. Tulare	Sept. 27	22.20	21.22	.47	.....	8.34	10.42	.146	.53	.44	2.60	.....
No. 2223. Amador station	Oct. 3	25.40	.....	.53	.....	.....	.....	.....	.....	.....	.....	.....
No. 2295. Mission San José	Oct. 12	20.20	.....	.88	.....	.....	.....	.....	.....	.....	.....	.....

	CARIGNANE	Color Readings. At Pressing.	One Month.	Two Months.	Three Months.	Four Months.
1891—No. 1525.	Asti, Sonoma County	44.0 2VR	28.6 3VR	21.7 4VR	15.4 1R	14.2 1R
No. 1576.	Paso Robles	33.3 3VR	14.4 4VR	7.6 R 1R	6.3 1R	
1892—No. 1628.	Tulare	13.3 4 5VR	7.4 3VR+Y	7.0 4VR+Y	6.0 R+Y	5.3 1R+Y
No. 1791.*	Mission San José	97.5 1VR	43.0 1VR	38.8 2VR	29.2 3VR	28.2 3VR
1893—No. 1871.	Amador station	71.4 4VR	55.5 1VR			
No. 1887.	Tulare	11.1 3VR	6.2 VR+Y	3.3 (YY)		
No. 2081.	Paso Robles	32.0 1VR	25.0 2VR	23.6 5VR	22.7 5VR	
1894—No. 2210.	Tulare	12.9 R	5.3 3R	6.2 2R	6.2 3R	

* Blend of Carignane and Robin noir.

RECORD OF TREATMENT.

No. 1251. *Carignane*, from Margherita Vineyard, Fresno. Received August 25, 1890, in good condition; bunches and berries very large, taste insipid, and watery. The must showed 20.6% of solid contents by spindle. The temperature of the grapes at crushing was 70°, and the maximum reached was 78°. The fermentation was very slow, and the must remained at about 78° for three or four days. On the seventh day the murk was drawn off when still sweet.

Six days after pressing the wine was dry, and in three weeks more clear. At two months it was bright, sound, very rough, and with little flavor. It was racked twice during the first seven months, and remained bright, becoming smoother, and at the end of that time was pleasant, but somewhat insipid. At seventeen months it was in good condition, with little color, some bouquet, neutral flavor, and full acid. Two months later it was mature, and some of it was bottled. At twenty-seven months the remainder was bottled. At three years both bottlings were sound, but flat and of poor quality.

No. 1335. *Carignane*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 13, 1890, in good condition, and mature. The must showed 21.5% of solid contents by spindle.

No. 1409. *Carignane*, from Mission San José. Received October 20, 1890, in fair condition, very soft and a few bunches moldy. The must showed 24.8% of solid contents by spindle. The grapes were used for a series of experimental fermentations, for the results of which see "Fermentations with various substances" (Part II of this report).

No. 1447. *Carignane*, from Tulare station. A sample for must analysis was received August 29, 1891, in good condition. The must showed 21.7% of solid contents by spindle.

No. 1525. *Carignane*, from Asti, Sonoma County. Received October 8, 1891, in good condition, and mature. The must showed 24.4% of solid contents by spindle. The temperature of the must at crushing was 66°, and the maximum of 81° was reached on the sixth day. On the ninth day the murk was drawn off while still a little sweet.

One month from pressing the wine was bright, quite dry, very rough, and with a burnt taste. At five months the wine had been racked twice, and was bright, vinous, with good body and some bouquet, generally much improved. It continued to improve and at sixteen months had developed into an excellent wine. Some of the wine was bottled at sixteen months, and some at twenty-two months. At three and a half years the wine last bottled was bright, with good color, marked bouquet, and full flavor, generally an excellent, clean-tasting wine, a little too astringent, but full and round. There was a little well-settled deposit in the bottles. The wine first bottled tasted undeveloped and had made a heavy deposit.

No. 1576. *Carignane*, from Paso Robles station. Received October 12, 1891, in good condition, but not mature; the grapes were very small. The must showed 19.7% of solid contents by spindle. The temperature of the grapes at crushing was 64°, and the maximum reached was 82°, on the third day. The murk was nearly dry on the third day, and was drawn off on the fourth.

At one month from pressing the wine was nearly clear, but coarse and not pleasing. At six months it had been racked twice, and was bright, had developed some bouquet, and was much improved, though still rough. It was racked twice after this, and remained bright, but did not improve much. At fifteen months it was bottled. The wine developed too quickly, owing to smallness of sample, and, though it kept in good order in bottle, did not develop its best qualities.

No. 1628. *Carignane*, from Tulare station. Received September 6, 1892, in good condition, and mature. The must showed 21.5% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the maximum reached was 87°, on the fourth day. The murk was dry on the fifth day, when it was drawn off.

A month after pressing the wine was clear, and was racked and taken to the cellar. At four months it was bright, fresh, smooth, and pleasing, but with little flavor. It was racked three times during the first year, and remained in good condition; was a good, clean-tasting, neutral wine, with little character. At fifteen months it was nearly mature, and was one of the best of the Tulare wines; the color was very deficient. At twenty-two months it was bottled. One year after bottling it was bright, with some bouquet and flavor, full acid for a Tulare wine—a good wine, but lacking in character, solidity, and color, yet superior to many of the Tulare wines.

No. 1742. *Carignane*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 24.8% of solid contents by spindle.

No. 1791. *Carignane*, from Mission San José. Received October 21, 1892, in poor condition. The must showed 20.6% of solid contents by spindle. This variety was fermented with No. 1792, Robin noir, from the same locality, about equal parts of each being used. The temperature of the grapes at crushing was 63°, and the maximum reached was 88°, on the third day. The murk was drawn off on the fourth day, when nearly mature.

A month after pressing the wine was nearly clear. At three months it was bright, rough and coarse, but sound and of good body. It was racked three times during the

first year, remained in good order, and gradually improved, losing its harshness. At fourteen months it was nearly mature, and at eighteen months was bottled.

No. 1871. *Carignane*, from Amador station. A sample for must analysis and for acid and tannin tests was received September 14, 1893, in good condition. The bunches were large, the berries small and well colored. The must showed 23.3% of solid contents by spindle.

No. 1887. *Carignane*, from Tulare station. Received September 22, 1893, in good condition. The bunches were large and compact; the berries large and mature, but not well colored or very sweet. The ripening was irregular, some of the bunches had dried berries, and some had berries still uncolored. This was due to the fact that some of the vines had grown in strong alkali ground, where they produced scantier foliage, and thus allowed the grapes to ripen earlier. The must showed 20.6° of solid contents by spindle. The temperature of the grapes at crushing was 65°, and the maximum reached was 92°, on the third day. On the fourth day the murk was dry, and was drawn off.

In three weeks the wine was clear. At five months the wine had been racked twice, was bright and pleasing. At eight months it was sound, but flat and without much character or color.

No. 2081. *Carignane*, from Paso Robles station. Received November 4, 1893, in fair condition. The bunches were large, close, irregular, and heavily shouldered; the berries large, thick-skinned, very sweet, and commencing to dry. The must showed 25.9% of solid contents by spindle. The temperature of the grapes at crushing was 62°, and the maximum reached was 92°, on the third day. The murk was drawn off on the fifth day, while still sweet.

In one month the wine was still sweet, but clear. In two months it was bright, of good flavor and aroma, medium acid, and good body and astringency, still slightly subsweet. At six months it had been racked twice, and was of good quality, but not quite clean-tasting.

MATARO.

(See Vit. Rept. 1887–89, p. 192.)

This variety has been rather extensively planted, but, unfortunately, principally in the cooler parts of the coast valleys, to which it is least suited. At Mission San José, in the cooler parts of the Santa Clara Valley, in San Mateo County, and the lower parts of the valleys of Sonoma and Napa, it has been well tested, and though it generally yields good crops it is too late and gives a very harsh, low-bodied, common wine, is often deficient in sugar, and seldom ripens before the autumn rains begin. In the warmest localities of the Santa Clara Valley, in the Livermore Valley, and at the Asti Vineyard in the warm Cloverdale Valley, it has done better, bearing good crops, making a sound, solid, somewhat coarse wine, good for blending purposes in the production of ordinary wines. It seems, however, more adapted to the southern parts of the State; it has given excellent results in Los Angeles and San Diego counties. At Fresno and Tulare the vine lacks sufficient foliage, rendering the grapes subject to sunburn. At the Amador foothill station the grapes run low in acid, and give a wine that tends to the Port type. At Paso Robles the wine is lacking in color, tannin, and body, but as the vines are young these faults may decrease.

The average of seven analyses of this variety from the Bay region is 20.7% of sugar and 0.70% of acid; the body and tannin are very low for this same region. The average of four analyses of grapes from Amador station is 24.6% of sugar and 0.37% of acid, showing enough sugar but low acid. At Fresno the composition of the must has been fairly satisfactory, but at Tulare it has been very low in acid.

Analyses of Musts and Wines.

MATARO.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar Test by Copper	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1890—No. 1252. Fresno	Aug. 25	21.30	20.24	.53	.42	8.48	10.58	.104	.50	.43	2.32
No. 1255. Amador County; G. A. Danet	Sept. 18	22.40	.....	.41	.40	9.20	11.45	.156	.63	.50	2.58
1891—No. 1574. Asti, Sonoma County	Oct. 7	23.05	22.67	.56	.36	9.70	12.09	.129	.55	.44	2.35
No. 1596. Asti, Sonoma County	Oct. 18	25.00	23.04	.50	.31	10.81	13.27	.236	.93	.82	3.35
No. 1609. Mountain View	Oct. 30	20.70	20.24	.78	.32	8.62	10.75	.143	.78	.52	2.55
No. 1610. San José; Dr. Dudley	Nov. 1	22.08	21.80	.77	.40	9.20	11.45	.162	.74	.55	2.45
No. 1611. Mountain View	Nov. 2	21.50	20.99	.70	.....	9.20	11.45	.255	.71	.39	2.55
1892—No. 1727. Paso Robles	Oct. 10	21.95	.....	.47	.....	.....	.....	.....	.....	.....	.....
1893—No. 1921. Paso Robles	Oct. 12	22.60	20.99	.60	.23	8.13	10.17	.070	.58	.42	2.30
1894—No. 2172. Amador station	Sept. 24	26.00	.....	.33	.....	.....	.....	.....	.....	.....	.....
No. 2313. Tulare	Oct. 15	23.00	.....	.28	.....	.....	.....	.....	.....	.....	.....

Color Readings.

MATARO.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.
1891—No. 1574. Asti, Sonoma County	24.4 4VR	15.5 5VR	7.8 1VR+Y	6.8 2VR+Y	.....
No. 1596. Asti, Sonoma County	125.0 2VR	70.0 5VR	48.6 4VR	47.6 5VR	32.5 5VR
No. 1596*a*. Asti, Sonoma County	143.0 1VR	63.5 4VR	55.5 3VR	47.0 4VR	35.7 4VR
No. 1609. Mountain View, San Mateo County	51.2 2VR	.....	.....	.....	.....
No. 1610. San José; Dr. Dudley	51.2 1–2VR	.....	.....	.....	.....
1893—No. 1921. Paso Robles	19.5 5VR	6.3 1R	4.1 3R	.....	.....

RECORD OF TREATMENT.

No. 1252. *Mataro*, from Margherita Vineyard, Fresno. Received August 27, 1890, in good condition. The bunches were large, the grapes large and mature. The must showed 21.3% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the maximum reached was 79°, on the fourth day. On the seventh day the murk was nearly dry, and was drawn off.

The wine was quite dry one week after pressing, but was some time in clearing. At two months it was bright, with light aroma, pleasing flavor, full acid, and medium astringency, very little color, neutral but agreeable. It was racked at one, three, and five months. The lees showed some *S. pastorianus* at four months. At eight months it was bright, and had improved; it possessed more character than No. 1251, Carignane. At seventeen months it was in good condition, and mature; it had lost almost all its color, and was neutral, with little bouquet, but clean taste. The wine was bottled, part at nineteen and part at twenty-nine months. At three years the wine first bottled was clear, sound, clean-tasting, lacking in delicacy; the second bottled was much inferior to the other, and had not kept well.

No. 1255, *Mataro*, from G. A. Danet, Amador County. These grapes were taken from six-year-old vines grown nearly on a hilltop, and well cultivated. Received September 20, 1890, in poor condition—loosely packed and much crushed. The bunches were of medium size and well filled. Many of the grapes were sunburnt. The must showed 22.4% of solid contents by spindle. The temperature of the grapes at crushing was 65°, and the maximum reached was 75°, on the fifth day. The fermentation was very sluggish, and the murk was drawn off on the seventh day while it was still sweet and fermenting.

In two weeks after pressing the wine was quite dry, but still cloudy. At two months it was clear and of marked and pleasing, but somewhat coarse, flavor and aroma, medium acid, good astringency and body. An examination of the lees at three months showed the presence of much *S. pastorianus*. At this date the wine was rough, but bright and sound, and was racked for the second time. After this it lost a little of its roughness, but though sound and agreeable was far from delicate. At fifteen months it was in good order and nearly mature. At sixteen months it was bottled. At three years the bottled wine was tasted, and found to be perfectly sound and in good order, clean-tasting and agreeable, but with little character; no deposit had been formed in the bottle.

No. 1574. *Mataro*, from Asti, Sonoma County. Received October 10, 1891, in good condition but for a little mold. The must showed 23.05% of solid contents by spindle. The temperature of the grapes at crushing was 61°, and the maximum reached was 82°. The murk was still a little sweet when drawn off on the seventh day.

The wine was nearly clear in five weeks, was without aroma, with little flavor, smooth, rather flat. In four months it was bright and somewhat improved, but its after-taste was not good. A month later it was in good order and a little improved, but without much character. After the second racking at ten months it continued to improve, and at sixteen months was smooth and well flavored. At eighteen months part of the wine was bottled. The part that was left in the cask deteriorated and acquired a bitter flavor. The remainder was bottled at twenty-two months. At three years and a half the bottled wine was tasted; it was bright, light in color, with some bouquet and flavor—a good, sound wine, not of high quality, but pleasing.

No. 1596. *Mataro*, from Asti, Sonoma County. Received October 21, 1891, in good condition. The grapes were mature and a few of them dried. The must showed 25.0% of solid contents by spindle. The grapes were divided into two parts of equal size; one part was fermented in the ordinary way, and the other was fermented according to Mr. Barth's system of close fermentation. The record of the ordinary fermentation is as follows: The temperature of the grapes at crushing was 67°, and the maximum reached was 80°, on the third day. The murk was still sweet on the fifth day, when it was drawn off.

In four days after pressing the wine was dry. It was somewhat slow in clearing. At five months it was bright, a coarse wine, tasting strongly of the stems. It was racked three times during the first fourteen months, and kept in good order. It remained sound and developed a little bouquet, but remained coarse, though a little smoother with age. It was bottled, part at eighteen months and part at twenty-two months. At three and one half years the bottled wine was bright, of good color, a little bouquet and flavor—a full, sound wine, with rather harsh acid, generally somewhat coarse, but good for blending. The later bottling was the better. No difference was perceptible in the wine fermented by Mr. Barth's process.

No. 1609. *Mataro*, from Mountain View, Santa Clara County. Received October 31, 1891, in poor condition. The must showed 20.7% of solid contents by spindle. The grapes were fermented with half the stems. The temperature of the grapes at crushing was 67°, and the maximum reached was 90°, on the third day. The murk was drawn off on the fourth day while still a little sweet, but on the sixth day was quite dry.

The wine was a little slow in clearing, but in two months was bright, sound, of good flavor, little aroma—good, but with little character. One month after the first racking the lees showed a few filaments, but as the wine tasted quite sound it was not pasteurized. At four months it was quite sound and had improved greatly, was a very fair, neutral wine. It was racked three times during the first year, and at fifteen months

was smooth, pleasing, and mature. It kept well after this, but developed very little bouquet. At twenty-one months it was bottled. At three and one half years the bottled wine was sound and good, with little character or color, but smooth and agreeable.

No. 1610. *Mataro*, from Dr. Dudley, San José. Received November 4, 1891, in fair condition—bruised, but with only a very little mold. The must showed 22.08% of solid contents by spindle. The grapes were divided into two parts: (1) for white wine, 361 lbs. were crushed, pressed, and fermented as white wine; (2) for red wine, 488 lbs. were crushed and fermented on the skins, together with two and a half gallons of juice from that pressed for white wine. The fermentation of the red wine was cool, and a little slow; the temperature of the grapes at crushing was 67°, and the maximum reached was 87°, on the third day. On the sixth day, while the murk was still a little sweet, it was drawn off. The white wine commenced at the same temperature, and fermented slowly for nearly a month, at the end of which time it was dry. The maximum temperature reached was 76°, on the third day.

Mataro (white). At the end of six weeks the wine was clear, dry, schiller, very acid, and raw. It was racked five times during the first year, and remained bright and sound, but coarse. At the end of fifteen months it had lost its schiller tint, and was in good condition; it was, however, very coarse and rough, and generally not a success as a white wine. At seventeen months it was racked, and a portion put in glass. At three and a half years the bottled wine was bright, without deposit, a good neutral wine, with little character, but smooth and agreeable; would have been useful as a neutral blend.

Mataro (red). Two weeks after pressing, the wine was nearly clear and quite dry. At one month it was bright, very rough, and somewhat coarse. The wine was of good color, remained bright, and developed well, though slowly. At the end of a year it was in good condition, had been racked three times, and tasted sound, though the lees showed a little "graisse." The wine matured slowly, remained fresh and agreeable, and developed a slight but not unpleasant bitterness. It was racked three times during the second year, at the end of which some of it was bottled, though it did not taste quite mature. At the end of thirty-three months it was racked again, and another portion put in glass. At three and a half years the later bottling was bright, good, and sound, with little bouquet or flavor—a common but drinkable wine; the earlier bottling had more color and flavor, but was not so clean-tasting.

No. 1611. *Mataro*, from Mountain View. Received November 5, 1891, in good condition, wet by the rain. The must showed 21.5% of solid contents by spindle. The grapes were divided into two equal parts, one of which was fermented in the ordinary way with the addition of the stems, and the other according to Mr. Barth's method of close fermentation, also with the addition of the stems. The ordinary fermentation commenced at a temperature of 66°, and reached its maximum temperature of 87° on the third day. It was drawn off on the fourth day, when nearly dry. The close fermentation commenced at the same temperature of 66°, and reached a maximum of 82° on the second day. It was drawn off on the seventh day, while still a little sweet.

Mataro (*b*) (ordinary fermentation). At three weeks the wine was still cloudy and with a trace of sugar, perhaps a little more than No. 1611*a*. At six weeks it was racked, when it was clear, and little if at all distinguished from No. 1611*a*. Soon after this the lees showed a little lactic and the taste was slightly affected. At nine weeks it was pasteurized. At four months it was in good condition, a rough, strong wine, sound but with little flavor or aroma, and of mediocre quality. It was racked twice after this before it was fifteen months old, when it was in good condition, much toned down, and of rather good quality, but with little distinctive character. Part of it was bottled at this age. At twenty-one months it had changed very little, and was indistinguishable from No. 1611*a*. The remainder was bottled at this date. At three and one half years the bottled wines were tasted. The earlier bottling of the ordinary fermentation was the best; bright, with little deposit—a good wine, but not of high quality. The close fermented wine, bottled at the same time, had deposited heavily and was not as clean-tasting, showing a slower development. The later bottlings of each sample showed little difference.

Mataro (*a*) (closed fermentation). At three weeks the wine was still cloudy, and contained a trace of sugar. At six weeks it was clear, of good flavor, but without aroma, still slightly sweet. At six weeks it was in good condition and had a little bouquet, and though the lees showed a few filaments, the taste was unaffected. It was pasteurized for safety. After this the record is the same as for No. 1611*b*, except that at first it had a little more bouquet. At twenty-one months both wines were practically identical, as far as the taste went.

No. 1727. *Mataro*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The grapes were very small. The must showed 21.95% of solid contents by spindle.

No. 1921. *Mataro*, from Paso Robles station. Received October 12, 1893, in good condition. The bunches were small, rather compact; the berries small, sweet, quite mature. The must showed 22.6% of solid contents by spindle. The temperature of the grapes at crushing was 69°, and the fermentation lasted five days, at the end of which time the murk was drawn off dry.

In three weeks the wine was nearly clear, showed high acid and low astringency. It was racked twice during the first two months, when it was clear and smoother, but lacking in color. The quantity was too small to keep well, and after this the wine deteriorated. At seven months it was much inferior to the Grenache from the same locality.

MOURASTEL.

(See Vit. Rept. 1883-85, p. 106; 1887-89, p. 197.)

This variety has fully maintained its European reputation as a heavy bearer. It is a strong grower and bears well almost everywhere, and in some places, such as Tulare and Fresno, it bears immense crops. It ripens late, but somewhat earlier than the Mataro. At Mission San José it gives a good neutral wine, excellent for blending, but thin. At first it has good color, but the color is very unstable and is quickly dropped. The average of five analyses gave 21.9% of sugar and 0.78% of acid. At Cupertino the average of five analyses was 22.9% of sugar and 0.76% of acid.

At Tulare the vine is a good grower and produces very fine, large, and sound grapes; the must has averaged 21.3% of sugar and 0.61% of acid, and ferments well. It produces a sound neutral wine, very similar to that of the Carignane of the same locality and with the same defects, viz., almost total lack of color, and low tannin.

At Paso Robles the grapes attain more sugar and sufficient acid. The variety is promising for this locality, though the color is somewhat at fault. The must has from medium to high percentages of acid in all localities, and is a good fermenter.

MOURASTEL.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At Six Months	Body
1890—No. 1326. Cupertino	Oct. 11	18.40	.....	1.37	.31	7.57	9.45	.099	.81	.62	2.32
No. 1330. Mission San José	Oct. 11	21.50	.....	.99	.24	8.62	10.75	.191	.78	.52	2.75
1891—No. 1439. Tulare	Aug. 24	19.70	.....	.64	.....	.....	.....	.....	.....	.....	.....
No. 1471. Fresno	Aug. 28	20.85	19.89	.80	.65	8.13	10.17	.168	.63	.53	2.70
No. 1528. Paso Robles	Oct. 5	20.60	20.24	.62	.34	.....	.....	.....	.....	.....	.....
No. 1569. Mission San José	Oct. 6	21.70	.....	.90	.....	8.77	10.91	.152	.88	.52	2.75
1892—No. 1690. Tulare	Sept. 26	21.50	21.38	.41	.33	8.55	10.67	.143	.48	.50	2.80
No. 1759. Paso Robles	Oct. 11	23.70	.....	.46	.....	.....	.....	.....	.....	.....	.....
1893—No. 1863. Amador station	Sept. 13	21.10	.....	1.03	.....	.....	.....	.....	.....	.....	.....
No. 1898. Tulare	Sept. 28	22.00	20.99	.71	.33	8.13	10.17	.087	.69	.47	2.45
No. 2045. Cupertino	Nov. 1	24.35	.....	.86	.....	.....	.....	.234	.93	.....	.....
No. 2071. Paso Robles	Nov. 3	24.25	23.91	.50	.33	9.56	11.91	.166	.63	.45	2.80
No. 2074. Mission San José	Nov. 3	22.10	20.99	.83	.23	8.48	10.58	.163	.78	.53	2.30
1894—No. 2176. Amador station	Sept. 24	24.40	.....	.49	.....	.....	.....	.....	.....	.....	.....
No. 2278. Tulare	Oct. 5	22.60	21.38	.50	.....	.....	.....	.139	.55	.45	2.60
No. 2343. Mission San José	Oct. 24	20.40	.....	.57	.....	.....	.....	.133	.58	.....	.....

COLOR READINGS.

MOURASTEL.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.
1891—No. 1471. Fresno	9.6 R	5.5 2R	4.1 4VR + Y	.....	.....
No. 1569. Mission San José	111.1 1VR	24.0 1R	.....	.....	.....
1892—No. 1690. Tulare	14.2 5VR	9.5 1VR + Y	5.5 2R + Y	.....	.....
1893—No. 1898. Tulare	11.7 5VR	4.2 5VR + Y	.....	.....	.....
No. 2045. Cupertino	56.3 VR	.....	.....	.....	.....
No. 2071. Paso Robles	30.8 3VR	15.4 R	10.4 R	10.5 5VR	9.3 R
No. 2074. Mission San José	70.2 3VR	52.0 2VR	52.7 2VR	44.9 1 2VR	26.3 3VR
1894—No. 2278. Tulare	11.5 2R	6.0 1R	5.2 3R + Y	.....	.....
No. 2343. Mission San José	39.2 4VR	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1326. *Mourastel*, from Cupertino. Received October 13, 1890, in fair condition, but not mature. The must showed 18.4 % of solid contents by spindle. The temperature of the crushed grapes was 65°, and the maximum reached was 92°, on the fourth day. The murk was still a little sweet on the fifth day, and was drawn off on the sixth.

Three weeks after pressing the wine was nearly clear, very acid, and light in color. At three months it was racked for the second time; the lees showed much *S. pastorianus;* the wine was quite bright, of good bouquet and flavor, high acid, medium body and astringency, vinous, and clean-tasting; it was of fairly good quality, but thin and green, and after six months deteriorated rapidly. In a year it had lost nearly all its color and quality.

No. 1330. *Mourastel*, from Mission San José. Received October 14, 1890, in good condition, and mature. The must showed 21.5 % of solid contents by spindle. The temperature of the grapes at crushing was 66°, and the maximum reached was 96°, on the fourth day, when, being nearly dry, the murk was drawn off.

The wine was somewhat slow in clearing, but in two months was clear and of fair quality; it had very little aroma and a neutral flavor, full acid, and medium astringency. It developed well, and at six months had improved much, the bouquet and flavor were marked and pleasing, the acid a little high. The lees showed a good deal of *S. pastorianus.* At fifteen months the wine was in good order, very fresh and pleasing, but not quite mature. At sixteen months part of the wine was bottled, and the rest bottled at twenty-six months. At thirty-nine months both wines were tasted; the first bottling had not kept well, but the second was in first-class order, with good flavor and bouquet, a smooth and agreeable wine.

No. 1439. *Mourastel*, from Tulare station. Received August 27, 1891, in good condition. The must showed 19.7 % of solid contents by spindle. Only a small sample for must analysis was received.

No. 1471. *Mourastel*, from Margherita Vineyard, Fresno. Received September 1, 1891, in good condition. The must showed 20.85 % of solid contents by spindle. The temperature of the grapes at crushing was 70°, and the maximum reached was 84°, on the fourth day. The fermentation was slow and the murk was still sweet when it was drawn off on the seventh day.

In two weeks the wine was nearly, and in six weeks quite, dry and clear; it was clean-tasting, with full acid and astringency, but little flavor or aroma. At four months the lees showed a little acetic ferment and some *S. pastorianus;* the wine was clear, clean-tasting, with little character, and showed signs of maturing quickly. It soon became bright and continued to improve up to seventeen months, becoming a light and agreeable wine, but lacking in quality and vinosity. Part of the wine was bottled at nineteen months, after which the rest, which was left in wood, deteriorated. More of the wine was bottled at twenty-three months. At three and one half years the wine of both bottlings was bright and very much improved, lacking in color and character, but good and clean-tasting, with no deposit, and perfectly mature; a good, neutral, blending wine. Some wine bottled at twelve months was spoiled.

No. 1528. *Mourastel*, from Paso Robles station. Received October 7, 1891, in good condition. The must showed 20.6 % of solid contents by spindle. The grapes were fermented with No. 1527, Grenache.

No. 1569. *Mourastel*, from Mission San José. Received October 9, 1891, in good condition, but somewhat sunburnt. The must showed 21.7 % of solid contents by spindle. The temperature of the must at crushing was 60°, and the maximum reached was 87°, on the fourth day. The murk was nearly dry on the fifth day, when it was drawn off.

At one month the wine was clear and showed good acid and astringency. At four months the lees showed a little "graisse," but the wine was bright, of good flavor, with some bouquet and generally much improved. At five months it was in good order and maturing well; it showed full acid and increased bouquet. A month later the lees were examined, and showed much *S. pastorianus.* At sixteen months it was good, clean-tasting, and mature. At this age part was bottled and the rest left in wood, where it kept perfectly and was bottled at twenty-two months. At three and a half years the later bottled wine was bright, light in color, without bouquet and with little flavor, high acid, a clean-tasting wine, but lacking character; the earlier bottled had rather more color and flavor.

No. 1690. *Mourastel*, from Tulare station. Received September 29, 1892, in good condition. The must showed 21.5 % of solid contents by spindle. The temperature of the must at crushing was 69°, and the maximum reached was 87°, on the third day. The murk was still a little sweet on the fourth day, and was drawn off on the fifth.

In one month after crushing the wine was nearly clear and quite dry. At three months it was bright, of good flavor, full astringency, somewhat coarse, but sound and good. After this the wine remained in good order and became smoother, but did not develop any bouquet. At fourteen months it was quite sound and nearly mature, but had lost nearly all its color. At eighteen months it was bottled.

No. 1759. *Mourastel*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 23.7 % of solid contents by spindle.

No. 1863. *Mourastel*, from Amador station. A sample for must analysis was received September 15, 1893, in poor condition; the grapes were very small, diseased, and not ripe.

No. 1898. *Mourastel*, from Tulare station. Received September 28, 1893, in good condition. The bunches were very large, irregular, and compact; the berries large, sound, and very fine in appearance, with thick skins, but little color. The must showed 22.0% of solid contents by spindle. The temperature of the grapes at crushing was 66°, and the maximum reached was 94°, on the fourth day. The murk was dry on the fifth day, when it was drawn off.

The wine was a little slow in clearing. A month after pressing it was nearly clear, clean-tasting, but without flavor or color. At five months it was clear, clean-tasting, with medium acid and astringency, little character, altogether a fairly drinkable wine. Being in a sixty-gallon keg it was much less advanced than other wines in smaller quantities. At this age it was racked into two twenty-five-gallon kegs. At nine months it was in good order, improved in flavor, and quite sound.

No. 2045. *Mourastel*, from J. T. Doyle, Cupertino. A sample for must analysis and for color and tannin tests was received October 31, 1893, in good condition. The bunches were over medium in size, irregular, short-conical, close; the berries over medium in size, pulpy, soft, mature, with little flavor. The must showed 24.35% of solid contents by spindle.

No. 2071. *Mourastel*, from Paso Robles station. Received November 3, 1893, in fair condition. The bunches were of medium size, conical, shouldered, compact; the berries over medium in size, round, thick-skinned, soft, overripe. The must showed 24.25% of solid contents by spindle. The temperature of the must at crushing was 62°, and the maximum reached was 80°, on the fourth day. The murk was dry on the sixth day, when it was drawn off.

In one month from pressing the wine was clear. In two months it was clear, rough, and astringent, with medium acid, good body, and coarse flavor. At six months it had been racked twice, and was much improved, still rough, but clean-tasting, and with good keeping qualities. At nine months it had changed little and still showed a trace of sugar, though quite sound. An examination of the lees showed the presence of *S. pastorianus*.

No. 2074. *Mourastel*, from Mission San José. Received November 3, 1893, in good condition. The bunches were over medium in size, conical, shouldered, compact; the berries of medium size, soft, thick-skinned, mature. The must showed 22.1% of solid contents by spindle. The temperature of the grapes at crushing was 61°, and the maximum reached was 89°, on the third day. The murk was dry on the fourth day, when it was drawn off.

The wine was clear within one month after pressing, and was racked twice during the first three months. At six months it was bright, with little bouquet, good flavor, medium astringency, full acid, clean taste—a good wine, but not of high quality. At nine months it was sound and in good order.

BECLAN.

(See Vit. Rept. 1883–85, p. 91; 1886, p. 73.)

For certain soils and locations this variety is more valuable than its limited distribution would seem to indicate. It is especially adapted to cooler localities and to fairly strong soils. Under these conditions it bears about three tons to the acre with short-pruning, shades its grapes sufficiently, and is very free from disease. In warmer localities or lighter soils it is less vigorous and deficient in foliage, rendering its grapes liable to sunburn. The bunches are regular, of medium size, long conico-cylindrical, with small shoulders and often a small wing, compact but not so much so as to press the berries out of shape or prevent the free circulation of air; the berries are under medium size, round, crisp, juicy, thick-skinned and not easily injured, and with a fresh and agreeable taste.

The grapes ripen earlier than the Cabernets, and a little later than the Pinots, attaining a good percentage of sugar (23% to 25%) with medium acid (0.40% to 0.50%). These figures refer to results obtained at Mission San José and Paso Robles. In warmer places, such as Tulare, the must is deficient in acid. In the rich soil of Tulare the vine grows vigorously where the alkali is not too strong, but does not bear well. The must from grapes grown at Mission San José ferments somewhat slowly but thoroughly, and makes a very good wine, of medium acid and tannin, sufficient color and clean taste. It requires, however, the addition of some Cabernet or similar grape, as, when alone, it lacks character. It has, in fact, a peculiar taste when pure, which is hardly agreeable, but which disappears with proper blending.

ANALYSES OF MUSTS AND WINES.

BECLAN.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At 6 to 8 Months	Body
1893—No. 1927. Paso Robles	Oct. 12	23.25	22.04	.50	.25	.....	.....	.259	.47	.....	.....
No. 1967. Tulare	Oct. 16	24.80	23.42	.23	.36	9.20	11.48	.138	.42	.44	3.20
1894—No. 2273. Mission San José	Oct. 3	23.70	22.90	.45	.....	.....	.....	.....	.47	.....	.....
No. 2314. Tulare	Oct. 13	24.50	.....	.33	.....	.....	.....	.....	.....	.....	.....

COLOR READINGS.

BECLAN.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1893—No. 1927. Paso Robles	54.8 VR	26.1 3VR	.....	.....	.....	.....
No. 1967. Tulare	36.7 VR	29.6 1VR	19.5 3VR	17.1 5VR	6.2 (Y)	5.0 (Y)
1894—No. 2273. Mission San José	70.8 1VR	60.6 1VR	49.4 1VR	19.0 4VR	.....	.....
No. 2273*a*. Mission San José	30.5 VR	23.1 VR	16.0 1VR	12.1 4VR	.....	.....

RECORD OF TREATMENT.

No. 1927. *Beclan*, from Paso Robles station. A sample for must analysis and for tannin and color tests was received October 12, 1893, in good condition. The bunches were small, narrow, cylindrical, very regular, and compact; the berries very small, round, juicy, somewhat shriveled, but with good acid. The must showed 23.25% of solid contents by spindle.

No. 1967. *Beclan*, from Tulare station. Received October 16, 1893, in good condition. The bunches were small, cylindrical, and close; the berries round, small, very sweet, and some of them dried. The must showed 23.42% of solid contents by spindle. The initial temperature of the must was 68°, and the maximum of 83° was reached on the third day. The fermentation was over on the fifth day.

In one month the wine was clear, clean-tasting, and of good flavor. At three months it was bright, smooth, and agreeable. At six months it retained its good quality, but was lacking in color.

PETIT BOUSCHET.

(See Vit. Rept. 1883–85, p. 109; 1887–89, p. 226.)

As a variety for the production of cutting wines at the Bay region stations this variety seems to be inferior to the Alicante Bouschet in everything but bearing and body. The average composition of the must at these stations has been: Sugar, 21.3%; acid, 0.77%; tannin, 0.414%, and body, 3.31%. This would indicate a wine excellent to blend with such a wine as that of the Beclan, which has flavor, delicacy, and full alcohol, but is lacking in color, tannin, and robustness. But for general purposes the Alicante would be preferable.

At Tulare the vines of this variety are growing in a somewhat alkaline, sandy soil; they are strong growers, with good foliage and are heavy bearers. From six to twelve tons per acre have been obtained, of very sound, well-ripened grapes. The must is rather low in sugar, but has sufficient acid. It has always fermented well and made a good, sound wine, not of high quality, but good for blending purposes. The wine has had sufficient color for itself, but not enough to be of use to blend with a wine lacking in color. In this respect it has fallen below Gros Mansenc, St. Macaire, and Barbera, and has been equaled by Refosco and Charbono. The wine is somewhat richer in tannin than that of Barbera, but falls below that of Refosco.

Analyses of Musts and Wines.

PETIT BOUSCHET.			MUST.				WINE.							
			Date of Picking	Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At Six Months.	Body
1890	No. 1245.	Fresno	Aug. 24	24.70	25.76	.51	.41						
	No. 1378.	Mission San José	Oct. 18	23.50		.80	.39	9.42	11.36	.485	.83	.37	3.32
	No. 1394.	Cupertino	Oct. 18	23.70		.69							
1891	No. 1435.	Tulare	Aug. 24	22.20	22.05	.53	.50	8.84	11.00	.227	.43	.45	3.12
	No. 1529.	Paso Robles	Oct. 5	20.05		.51	.45						
1892	No. 1627.	Tulare	Sept. 3	22.20	21.38	.57	.45	8.41	11.09	.185	.58	.50	3.05
	No. 1745.	Paso Robles	Oct. 11	20.40		.54							
	No. 1778.	Mission San José	Oct. 13	21.60	21.80	.92							
1893	No. 1882.	Tulare	Sept. 15	21.20	19.54	.65	.32	8.07	10.03	.221	.48	.52	2.85
	No. 2009.	Paso Robles	Oct. 26	24.80	24.12	.47	.29	9.56	11.91	.480	.48	.47	3.10
	No. 2048.	Cupertino	Nov. 1	20.40		.80				.473			
	No. 2120.	Cupertino	Nov. 7	18.60		.84				.502			
1894	No. 2168.	Tulare	Sept. 20	22.30	21.80	.43		8.48	10.58	.298	.55	.35	2.85
	No. 2226.	Mission San José	Oct. 4	19.70	19.21	.73		6.42	8.07	.266	.77	.62	3.30
	No. 2293.	Mission San José	Oct. 12	21.50		.58		7.64	9.54	.345		.49	3.50

Color Readings.

PETIT BOUSCHET.			At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.	Six Months.
1891	No. 1435.	Tulare	15.5 2R	11.6 3VR+Y	7.1 1R+Y	6.4 1R+Y	7.1 2R+Y	8.3 3R+Y	
1892	No. 1627.	Tulare	38.4 4VR	21.5 5VR	12.9 1R	11.4 1R	11.8 2R	11.4 2R	11.4 2R
1893	No. 1882.	Tulare	57.1 2VR	37.0 5VR	20.6 R 1R	22.3 R	19.1 1R	16.9 1R	
	No. 2009.	Paso Robles	118.0 VR	64.5 2VR	55.5 2VR	50.6 2VR	40.4 3VR		
	No. 2048.	Cupertino	160.0 1 2VR						
	No. 2120.	Cupertino	133.0 3VR						
1894	No. 2168.	Tulare	48.8 2VR	18.6 R	19.0 R	16.2 R			
	No. 2226.	Mission San José	105.0 2VR	75.5 1VR	64.5 1VR	42.5 1VR			
	No. 2293.	Mission San José	154.0 VR-1VR	95.2 VR	86.9 1VR	42.6 1VR			

RECORD OF TREATMENT.

No. 1245. *Petit Bouschet*, from Margherita Vineyard, Fresno. Received August 26, 1890, in good condition, and mature. The must showed 24.7% of solid contents by spindle and 0.51% of acid. The grapes were mixed with No. 1241, Alicante Bouschet, from the same vineyard.

No. 1378. *Petit Bouschet*, from Mission San José. Received October 20, 1890, in good condition, but overripe and shriveled. The must showed 23.5% of solid contents by spindle and 0.80% of acid. The temperature of the must at crushing was 69°, and the maximum reached was 96°, on the third day. On the fourth day the murk was dry, and was drawn off.

In one month the wine was clear, very raw and astringent, and of very intense color. At three months it was bright and had been racked twice. It had no bouquet, and tasted flat and a little suspicious. An examination of the lees showed the presence of filaments, so the wine was pasteurized. At two months after pasteurizing it was clear, had improved in flavor, developed a little bouquet, and was generally improved. It was of fair quality, but heavy-bodied, very astringent, and coarse. After this it did not improve much, and at seventeen months part of it was put in bottle; at twenty-three months the rest was bottled. At twenty-seven months that first bottled was spoiled; the second was bright, of intense color and good tint, but not of high quality.

No. 1394. *Petit Bouschet*, from Cupertino. A sample for must analysis was received October 21, 1890, in fair condition, but somewhat shriveled and overripe. The must showed 23.7% of solid contents by spindle and 0.69% of acid.

No. 1435. *Petit Bouschet*, from Tulare station. Received August 27, 1891, in good condition; the juice was but slightly colored. The must showed 22.2% of solid contents by spindle and 0.53% of acid. The temperature of the must at crushing was 66°, and the maximum reached was 85°, on the fourth day. On the afternoon of the fourth day the murk was dry, and was drawn off.

In three weeks the wine was nearly clear and quite dry, but very rough and not agreeable. A month later it was clear and sound, but of poor quality and little color. At four months it had been racked twice, and was in good order, with little flavor, but clean taste; in general, was much improved. After this it soon deteriorated, being in a very small keg; and at seven months the lees showed acetic germs and filaments. At nine months it was no longer worth keeping.

No. 1529. *Petit Bouschet*, from Paso Robles station. A sample for must analysis was received October 7, 1891, in good condition. The must showed 20.05% of solid contents by spindle and 0.51% of acid.

No. 1627. *Petit Bouschet*, from Tulare station. Received September 6, 1892, in good condition; the bunches were large and well filled. The must showed 22.2% of solid contents by spindle and 0.57% of acid. The temperature of the must at crushing was 68°, and the maximum reached was 90°, on the third day. On the fifth day the murk was drawn off while still fermenting.

One month after pressing the wine was nearly clear and quite dry. At four months it was bright, not of very pleasing odor, but of good flavor, and generally a good wine. Three months later it was in good condition and the bouquet had much improved. At nine months it had been racked three times and had changed very little since the last tasting. At eleven and at fifteen months it was in good condition—an agreeable wine and perfectly sound, but very light in color for a Bouschet. At nineteen months it was bottled. At three and one half years the bottled wine was bright, of sufficient color, with rather more character than the Refosco of the same locality, but not quite so clean-tasting.

No. 1745. *Petit Bouschet*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 20.4% of solid contents by spindle and 0.51% of acid.

No. 1778. *Petit Bouschet*, from Mission San José. Received October 15, 1892, in good condition. The must showed 21.6% of solid contents by spindle and 0.92% of acid. The grapes were fermented with No. 1767, Herbemont, from the same vineyard.

No. 1882. *Petit Bouschet*, from Tulare station. Received September 17, 1893, in good condition. The bunches were short, irregular, of medium size, well filled, but not compact; the berries were large and well colored, but the juice not very red. They were the healthiest and finest red grapes yet received from Tulare. Most of the grapes were mature, but a few bunches were rather green and seemed to be second crop, though as large as the others. The must showed 21.2% of solid contents by spindle and 0.65% of acid. The temperature of the grapes at crushing was 67°, and the maximum reached was 93°, on the third day. On the fourth day the murk was dry, and was drawn off.

The wine remained cloudy for six weeks, and tasted flat. In two months it was nearly clear, and was racked and taken to the cellar. At six months it was clear, with some bouquet and flavor, medium acid and astringency, enough color for a red wine, but very little for a Bouschet. At twelve months it was in good order, with more color and flavor than the Mourastel of the same vineyard and year, but not quite so clean-tasting.

No. 2009. *Petit Bouschet*, from Paso Robles station. Received October 26, 1893, in good condition. The bunches were large, winged, and well filled, on large peduncles; the berries of medium size, round, firm, very sweet, and with deep red juice; some berries were dried. The must showed 24.8% of solid contents by spindle and 0.47% of acid. The temperature of the grapes at crushing was 62°, and the maximum reached was 87°, on the third day. On the sixth day the murk was nearly dry, and was drawn off.

In one month the wine was clear, and was racked and taken to the cellar. In three months it was bright, of good flavor and aroma, very astringent, with medium acid—a good, sound wine, but very rough. Tastings at six and at nine months showed a gradual improvement. The wine remained in good order, and at nine months was possessed of flavor and aroma, but was still sub-sweet and very immature.

No. 2048. *Petit Bouschet*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were over medium in size, conical and close; the berries of medium size, were very juicy, and the juice deeply colored, and mature. The must showed 20.4% of solid contents by spindle and 0.80% of acid.

ALICANTE BOUSCHET.

(See Vit. Rept. 1887-89, p. 224.)

This variety has shown itself to be one of the most "solid" wines yet tested. With a good amount of sugar, it has high acid, tannin, and body, being equal in these respects to any of the North Italian varieties. Leaving out of consideration the grapes from grafts of one year, which are not typical, the average composition of the must of this variety for three years, as grown in the Bay region, is 24.2% of sugar and 0.98% of acid. Of the three wines made during this time, the average tannin content was 0.492%, and the body of the only one determined was 3.05%. The wine, when made up alone, is too heavy to be agreeable, but it is clean-tasting, and as a blend for thin wines would be hard to excel. At Fresno this grape has not done well, but was not sufficiently investigated and is worthy of further trial.

From Oakville, Napa County, the Alicante Bouschet is reported as giving a "thin wine of good quality," and as being occasionally subject to coulure. In the St. Helena and Alhambra valleys it has given satisfaction, yielding good crops of grapes excellent for blending purposes. The grapes ripen at about the same time as the Zinfandel, and, though sometimes not ripening very evenly, they are much more resistant than the latter.

Analyses of Musts and Wines.

ALICANTE BOUSCHET.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	By Volume	Tannin	Total Acid as Tartaric. At Pressing	At Six Months	Body
1890—No. 1241. Fresno	Aug. 24	22.15	20.61	.71	.42	9.05	11.27	.214	.....	.53	2.82
No. 1396. Cupertino	Oct. 19	25.90	.....	1.02	.....	.....	.....	.....	.....	.....	.....
1891—No. 1581. Mission San José	Oct. 13	24.35	22.67	.77	.43	9.56	11.91	.398	.72	.50	3.05
1892—No. 1790. Mission San José	Oct. 18	23.70	.....	.81	.....	.....	.....	.....	.....	.....	.....
1893—No. 2046. Cupertino	Oct. 30	23.70	.....	1.25	.....	.....	.....	.604	1.31	.....	.....
No. 2112. Cupertino	Oct. 30	23.10	.....	1.03	.....	.....	.....	.474	.83	.....	.....

Color Readings.

ALICANTE BOUSCHET.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.	Ten Months.
1890—No. 1241. Fresno	48.6 3VR	25 4VR	25.7 4-5VR	19.3 2R	14.6 1-2R	13.1 2R	13.1 3VR+Y
1891—No. 1581. Mission San José	363.0 VR	235 1VR	114.3 1VR	118.3 1VR	105.3 1VR	.....	.....
1893—No. 2046. Cupertino	190.0 1VR	.....	.....	.....	.....	.....	.....
No. 2112. Cupertino	148.0 1VR	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1241. *Alicante Bouschet*, from Margherita Vineyard, Fresno. Received August 25, 1893, in fair condition. The bunches were large, pyramidal, and sometimes shouldered, on slender but tough peduncles; the berries were round, variable in size, on long, tough pedicels; the grapes were crisp, juicy, and mature. The must showed 22.15% of solid contents by spindle, and 0.71% of acid. The grapes were fermented with No. 1245, Petit Bouschet, in the proportion of 73% of Alicante to 27% of the other. The temperature of the must at starting was 66°, and the maximum reached was 92°, on the third day. On the fifth day the murk was dry, and was drawn off.

The wine was slow in clearing, and fermented quietly for several weeks. At two months it was nearly clear, but tasted a little suspicious. At three months the wine was racked, and taken to the cellar; a little later an examination of the lees showed the presence of filaments, and the wine was pasteurized. After pasteurizing it became clear, but the taste was affected by the secondary fermentation. At nineteen months it was bright, much improved in taste, and quite mature. It was racked for the fourth time, and some of it bottled. When it was two years old it was all bottled. At three and one half years the wine first bottled was spoiled; that bottled later was bright and in good order, but flat and of poor quality.

No. 1396. *Alicante Bouschet*, from Cupertino. A sample for must analysis was received October 21, 1890, in bad condition—shriveled and moldy. The must showed 25.9% of solid contents by spindle and 1.02% of acid.

No. 1581. *Alicante Bouschet*, from Mission San José. Received October 16, 1891, in poor condition, and not quite mature. The must showed 24.35% of solid contents by spindle and 0.77% of acid. The temperature of the grapes at crushing was 69°, and the maximum reached was 82°, on the third day. On the fourth day the murk was dry, and was drawn off.

At one month the wine was clear, with some aroma and good flavor, full astringency, and good acid. During the first three months it was racked twice, and at the end of that time the lees were examined and found to be sound. At five months it was bright, a round, full-bodied wine, of neutral character, maturing quickly. At seven months it was very smooth and agreeable, but with plenty of tannin. At ten months it was bottled. At three and one half years the bottled wine was bright, of intense color, some bouquet, and good flavor. It was a very heavy but clean-tasting wine—a model blend for improving wines lacking in body, tannin, and color.

No. 1790. *Alicante Bouschet*, from Mission San José. Received October 21, 1892, in poor condition. The must showed 23.7% of solid contents by spindle and 0.81% of acid. The grapes were fermented with No. 1789, Cinsaut, from the same vineyard.

No. 2046. *Alicante Bouschet*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were of medium size, irregular, winged, loose, coulured; the berries of medium size, juicy, thick-skinned, with good acid and white juice; the grapes were mature. The must showed 23.7% of solid contents by spindle and 1.25% of acid.

No. 2112. *Alicante Bouschet*, from Cupertino. A sample for must analysis was received November 1, 1893, in good condition. The must showed 23.1% of solid contents by spindle and 1.03% of acid.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SOUTHERN FRENCH TYPE.

Number	LOCALITY.	Vintage of	MUST.				WINE.				
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Tannin	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At 6 to 8 Months	Body
	Aramon.										
1246	Fresno	1890	21.10	20.99	.65	.36	10.58	.248	.50	.39	2.82
1474	Fresno	1891	21.50	.....	.57	.....	10.42	.210	.66	.44	2.60
1377	Mission San José	1890	22.10	.....	.81	.29	11.45	.149	.71	.36	2.58
2299	Mission San José	1894	22.80	.....	.61	.....	.....	.147	.72	.....	.....
1414	Cupertino	1890	23.00	.....	.51	.22	12.18	.298	.62	.44	2.82
2054	Cupertino	1893	23.40	.....	62	.....	.....	.345	.79	.....	.....
1436	Tulare	1891	20.20	.....	.53	.....	.....	.....	.....	.....	.....
1639	Tulare	1892	21.50	20.44	.57	.34	11.00	.242	.53	.44	2.65
1918	Tulare	1893	21.50	19.21	.74	.44	9.90	.147	.68	.47	2.60
2290	Tulare	1894	22.85	21.80	.48	.....	10.58	.052	.56	.....	2.65
"(a)	Tulare	1894	22.85	21.80	.48	.....	10.75	.285	.42	.58	2.60
1659	Amador station	1892	20.30	.....	.76	.....	.....	.....	.....	.....	.....
1826	Amador station	1893	18.60	.....	.86	.23	.....	.182	.86	.....	.....
2178	Amador station	1894	20.40	.....	.67	.....	.....	.....	.....	.....	.....
2316	Amador station	1894	23.40	.....	.45	.....	.....	.....	.....	.....	.....
1755	Paso Robles	1892	21.50	.....	.48	.....	.....	.....	.....	.....	.....
	Average, Fresno	.....	**21.30**	**20.90**	**.61**	**.36**	**10.50**	**.229**	**.58**	**.42**	**2.71**
	Average, Mission San Jose	.....	**22.45**	.....	**.71**	**.29**	**11.45**	**.148**	**.72**	**.36**	**2.58**
	Average, Cupertino	.....	**23.20**	.....	**.57**	**.22**	**12.18**	**.322**	**.71**	**.44**	**2.82**
	Average, Tulare	.....	**21.78**	**20.81**	**.56**	**.39**	**10.56**	**.181**	**.55**	**.49**	**2.62**
	Average, Amador station	.....	**20.69**	.....	**.68**	**.23**	.....	**.182**	**.86**	.....	.....
	Cinsaut.										
1408	Mission San José	1890	22.35	.....	.44	.21	12.36	.122	.....	.41	2.58
1789	Mission San José	1892	22.10	.....	.53	.....	.....	.....	.....	.....	.....
2307	Mission San José	1894	20.85	.....	.44	.....	.....	.....	.....	.....	.....
1434	Tulare	1891	25.20	24.22	.52	.64	12.00	.120	.42	.30	3.80
1614	Tulare	1892	22.05	22.24	.58	.....	10.90	.103	.43	.47	2.95
1842	Tulare	1893	21.95	20.24	.62	.37	11.00	.083	.52	.49	2.60

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SOUTHERN FRENCH TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST.				WINE.				
			Solid Contents by Sp ndle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Tannin	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At 6 to 8 Months.	Body
	Cinsaut—Continued.										
2138	Tulare	1894	22.00	21.38	.47	.....	10.58	.136	.42	.42	2.60
1477	Paso Robles	1891	18.60	.....	.58	.....	.....	.....	.....	.....	.....
1655	Paso Robles	1892	22.60	.....	.57	.....	.....	.....	.....	.....	.....
1825	Amador station	1893	21.05	.....	.69	.....	.....	.284	.83	.....	.....
2159	Amador station	1894	26.50	.....	.45	.....	.....	.....	.....	.....	.....
2050	Cupertino	1893	19.10	.....	.61	.....	.....	.467	.79	.....	.....
	Average, Mission San Jose	.....	**21.77**	.....	**.47**	**.21**	**12.36**	**.120**	**.42**	**.30**	**3.80**
	Average, Tulare	.....	**22.80**	**22.02**	**.55**	**.50**	**11.12**	**.110**	**.45**	**.42**	**2.99**
	Average, Paso Robles	.....	**20.60**	.....	**.58**	.....	.....	.....	.....	.....	.....
	Average, Amador station	.....	**23.88**	.....	**.57**	.....	.....	**.284**	**.83**	.....	.....
	Grenache.										
1249	Fresno	1890	24.10	23.72	.57	.40	12.07	.153	.55	.46	3.02
1333	Cupertino	1890	24.35	.....	.62	.....	.....	.....	.....	.....	.....
1444	Tulare	1891	22.60	.....	.53	.....	.....	.....	.....	.....	.....
1626	Tulare	1892	23.25	23.13	.47	.35	11.73	.172	.55	.48	2.90
1845	Tulare	1893	22.80	20.61	.53	.33	11.00	.109	.52	.....	2.70
2170	Tulare	1894	25.10	24.97	.47	.....	12.91	.150	.40	.44	2.85
1527	Paso Robles	1891	24.40	24.12	.45	.....	12.09	.180	.....	.40	2.55
1721	Paso Robles	1892	22.60	22.23	.56	.45	11.27	.146	.50	.55	2.85
2010	Paso Robles	1893	28.20	27.65	.51	.29	13.54	.224	.51	.60	2.85
1822	Amador station	1893	23.25	.....	.74	.....	.....	.288	.80	.....	.....
2193	Amador station	1894	28.00	.....	.46	.....	.....	.....	.....	.....	.....
	Average, Tulare	.....	**23.44**	**22.90**	**.50**	**.34**	**11.88**	**.144**	**.49**	**.46**	**2.82**
	Average, Paso Robles	.....	**25.07**	**24.67**	**.51**	**.37**	**12.30**	**.183**	**.51**	**.52**	**2.75**
	Average, Amador station	.....	**25.63**	.....	**.60**	.....	.....	**.288**	**.80**	.....	.....

	Ploussard.										
1261	Mission San José	1890	24.80		.55	.34	12.18	.115	.46	.41	2.95
1505	Mission San José	1891	25.30	25.41	.45		12.64	.188	.41	.42	3.05
1637	Mission San José	1892	22.00		.57						
1983	Mission San José	1893	25.90	24.75	.56		13.27	.182	.58	.61	2.80
1291	Cupertino	1890	25.10		.57	.21					
	Average, Mission San Jose		**24.50**	**25.08**	**.53**	**.34**	**12.69**	**.162**	**.48**	**.48**	**2.93**
	Trousseau.										
1204	Fresno	1890	22.27	22.05	.58	.52	11.00	.084	.47	.43	2.60
1458	Fresno	1891	27.65		.61		19.28	.160	.56	.20	6.85
1498	Asti, Sonoma County	1891	24.60	23.13	.41	.39	12.18	.065		.47	2.70
1510	Mission San José	1891	25.20	26.31	.53						
1925	Paso Robles	1893	26.90	26.12	.26	.34		.176	.38		
2335	Tulare	1894	26.80		.30						
	Bastardo.										
1354	Cupertino	1890	25.77		.44						
2047	Cupertino	1893	28.00		.63			.252	.75		
1479	Paso Robles	1891	22.90		.43						
1641	Paso Robles	1892	22.15		.64						
1865	Paso Robles	1893	23.90	22.95	.49	.34	11.48	.151	.38	.40	2.80
1625	Tulare	1892	24.80		.41						
2149	Tulare	1894	26.50		.41						
1709	Mission San José	1892	23.70	22.95	.85	.26					
2266	Mission San José	1894	25.90		.47						
1834	Amador station	1893	24.80		.72			.358	.68		
	Average, Cupertino		**26.89**		**.54**			**.252**	**.75**		
	Average, Paso Robles		**22.98**	**22.95**	**.52**	**.34**	**11.48**	**.151**	**.38**	**.40**	**2.80**
	Average, Tulare		**25.65**		**.41**						
	Average, Mission San Jose		**27.20**		**.68**	**.26**					
	Chauché noir.										
1227	Fresno	1890	28.40	28.62	.34	.56					
1290	Cupertino	1890	25.00		.55						
2109	Cupertino	1893	30.90		.65			.307			
1298	Mission San José	1890	26.30		.53	.39	13.27			.32	2.45
1685	Mission San José	1892	24.10		.64						
2075	Mission San José	1893	29.10		.47		14.20	.173	.54	.40	3.10
1446	Tulare	1891	26.90		.46						
1795	Tulare	1893	22.80	21.38	.68	.60	10.58		.56		3.80
2150	Tulare	1894	28.40		.45						
1557	Paso Robles	1891	22.15		.82						
1652	Paso Robles	1892	19.25		1.71						

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SOUTHERN FRENCH TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric.	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing.	WINE. Total Acid as Tartaric. At 6 to 8 Months.	WINE. Body
	Chauché noir—Continued.										
1868	Paso Robles	1893	21.95	20.99	.92	.....	10.42	.112	.45	.56	3.10
1832	Amador station	1893	25.00	.....	.68	.....	.....	.362	.67	.....	.....
	Average, Cupertino	.....	**27.95**	.....	**.60**	.....	.....	**.307**	.....	.....	.....
	Average, Mission San Jose	.....	**26.50**	.....	**.55**	**.39**	**13.63**	**.173**	**.54**	**.36**	**2.78**
	Average, Tulare	.....	**26.03**	**21.38**	**.53**	**.60**	**10.58**	.....	**.56**	.....	**3.80**
	Average, Paso Robles	.....	**21.12**	**20.99**	**1.15**	.....	**10.42**	**.112**	**.45**	**.56**	**3.10**
	Dolcetto.										
1348	Cupertino	1890	19.50	.....	.80	.....	.....	.....	.....	.....	.....
2111	Cupertino	1893	26.90	.....	.58	.....	.....	.259	.....	.....	.....
1572	Asti, Sonoma County	1891	27.45	27.65	.31	.30	.....	.....	.....	.....	.....
	Average, Cupertino	.....	**23.20**	.....	**.69**	.....	.....	**.259**	.....	.....	.....
	Carignane.										
1251	Fresno	1890	20.60	19.89	.74	.41	11.09	.125	.56	.48	2.36
1335	Cupertino	1890	21.50	.....	.72	.....	.....	.....	.....	.....	.....
1409	Mission San José	1890	24.80	.....	.95	.33	12.64	.213	.65	.66	3.08
1409	Mission San José (closed vat)	1890	24.80	.....	.95	.27	13.09	.199	.....	.54	2.82
1409	Mission San José (calc. sulph.)	1890	24.80	.....	.95	.45	12.91	.213	.....	.62	3.94
1409	Mission San José (calc. phosph.)	1890	24.80	.....	.95	.40	12.18	.180	.....	.56	3.22
1409	Mission San José (amm. phosph.)	1890	24.80	.....	.95	.39	12.36	.217	.....	.48	3.82
1791	Mission San José	1892	20.60	.....	.99	.....	.....	.....	.....	.....	.....
2295	Mission San José	1894	20.20	.....	.88	.....	.....	.....	.....	.....	.....
1447	Tulare	1891	21.70	.....	.44	.....	.....	.....	.....	.....	.....
1628	Tulare	1892	21.50	18.89	.59	.38	10.42	.143	.54	.56	3.30
1887	Tulare	1893	20.60	18.90	.71	.26	9.90	.070	.56	.53	2.60
2210	Tulare	1894	22.20	21.22	.47	.....	10.42	.146	.53	.44	2.60
1525	Asti, Sonoma County	1891	24.40	23.61	.48	.33	12.54	.240	.57	.48	2.78

1576	Paso Robles	1891	19.70	17.44	.67	.35	9.00	.123	.63	.48	2.60
1742	Paso Robles	1892	24.80		.35						
2081	Paso Robles	1893	25.90	24.12	.51	.34	12.18	.154	.47	.48	3.30
1871	Amador station	1893	23.30	20.61	.90	.22		.400			
2173	Amador station	1894	22.60		.68						
2223	Amador station	1894	25.40		.53						
	Average, Mission San Jose		**21.89**		**.94**	**.33**	**12.64**	**.213**	**.65**	**.66**	**3.08**
	Average, Tulare		**21.50**	**19.67**	**.55**	**.31**	**10.25**	**.120**	**.54**	**.51**	**2.83**
	Average, Paso Robles		**26.47**	**20.78**	**.51**	**.35**	**10.59**	**.139**	**.55**	**.48**	**3.45**
	Average, Amador station		**23.77**	**20.61**	**.70**	**.22**		**.400**			
	Mataro.										
1252	Fresno	1890	21.30	20.24	.53	.42	10.58	.104	.50	.43	2.32
1255	Amador station	1890	22.40		.41	.40	11.45	.156	.63	.50	2.58
2172	Amador station	1894	26.00		.33						
1574	Asti, Sonoma County	1891	23.05	22.67	.56	.36	12.09	.129	.55	.44	2.35
1596	Asti, Sonoma County	1891	25.00	23.04	.50	.31	13.27	.236	.93	.82	3.35
1609	Mountain View	1891	20.70	20.24	.78	.32	10.75	.143	.78	.52	2.55
1611	Mountain View	1891	21.50	20.99	.70		11.45	.255	.71	.39	2.55
1610	San José; Dr. Dudley	1891	22.08	21.80	.77	.40	11.45	.162	.74	.55	2.45
1727	Paso Robles	1892	21.95		.47						
1921	Paso Robles	1893	22.60	20.99	.60	.23	10.17	.070	.58	.42	2.30
2313	Tulare	1894	23.00		.28						
	Average, Amador station		**24.20**		**.37**	**.40**	**11.45**	**.156**	**.63**	**.50**	**2.58**
	Average, Asti, Sonoma County		**24.03**	**22.86**	**.53**	**.34**	**12.68**	**.183**	**.74**	**.63**	**2.35**
	Average, Mountain View		**21.10**	**20.62**	**.74**	**.32**	**11.10**	**.199**	**.75**	**.46**	**2.55**
	Average, Paso Robles		**22.80**	**20.99**	**.44**	**.23**	**10.17**	**.070**	**.58**	**.42**	**2.30**
	Mourastel.										
1326	Cupertino	1890	18.40		1.37	.31	9.45	.099	.81	.62	2.32
2045	Cupertino	1893	24.35		.86			.234	.93		
1330	Mission San José	1890	21.50		.99	.24	10.75	.191	.78	.52	2.75
1569	Mission San José	1891	21.70		.90		10.91	.152	.88	.52	2.75
2074	Mission San José	1893	22.10	20.99	.83	.23	10.58	.163	.78	.53	2.30
2343	Mission San José	1894	20.40		.57			.133	.58		
1439	Tulare	1891	19.70		.64						
1690	Tulare	1892	21.50	21.38	.41	.33	10.67	.143	.48	.50	2.80
1898	Tulare	1893	22.00	20.99	.71	.33	10.17	.087	.69	.47	2.45
2278	Tulare	1894	22.60	21.38	.50			.139	.55	.45	2.60
1471	Fresno	1891	20.85	19.89	.80	.65	10.17	.168	.63	.53	2.70
1528	Paso Robles	1891	20.60	20.24	.62	.34					
1759	Paso Robles	1892	23.70		.46						
2071	Paso Robles	1893	24.25	23.91	.50	.33	11.91	.166	.63	.45	2.80
1863	Amador station	1893	21.10		1.03						
2176	Amador station	1894	24.40		.49						

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SOUTHERN FRENCH TYPE—Continued.

Number	LOCALITY	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
	Mourastel—Continued.										
	Average, Cupertino	.....	**21.38**	.....	**1.11**	**.31**	**9.45**	**.167**	**.87**	**.62**	**2.32**
	Average, Mission San Jose	.....	**21.42**	**20.99**	**.82**	**.24**	**10.74**	**.159**	**.73**	**.52**	**2.60**
	Average, Tulare	.....	**21.45**	**21.35**	**.56**	**.33**	**10.42**	**.123**	**.57**	**.47**	**2.62**
	Average, Paso Robles	.....	**22.85**	**22.08**	**.53**	**.34**	**11.91**	**.166**	**.63**	**.45**	**2.80**
	Average, Amador station	.....	**22.75**	.....	**.76**	.....	.....	.....	**.76**	.....	.....
	Beclan.										
1927	Paso Robles	1893	23.25	22.04	.50	.25	.....	.259	.47	.....	.....
2273	Mission San José	1894	23.70	22.90	.45	.....	.....	.....	.....	.....	.....
1967	Tulare	1893	24.80	23.42	.23	.36	11.48	.138	.42	.....	.....
2314	Tulare	1894	24.50	.....	.33	.....	.....	.....	.....	.....	.....
	Average, Tulare	.....	**24.65**	**23.42**	**.28**	**.36**	**11.48**	**.138**	**.42**	.....	.....
	Petit Bouschet.										
1245	Fresno	1890	24.70	25.76	.51	.41	.....	.....	.....	.....	.....
1378	Mission San José	1890	23.50	.....	.80	.39	11.36	.485	.83	.37	3.32
1778	Mission San José	1892	21.60	21.80	.92	.....	.....	.....	.....	.....	.....
2226	Mission San José	1894	19.70	19.21	.73	.....	8.07	.266	.77	.62	3.30
2293	Mission San José	1894	21.50	.....	.58	.....	9.54	.345	.....	.49	3.50
1394	Cupertino	1890	23.70	.....	.69	.....	.....	.....	.....	.....	.....
2048	Cupertino	1893	20.40	.....	.80	.....	.....	.473	.....	.....	.....
2120	Cupertino	1893	18.60	.....	.84	.....	.....	.502	.....	.....	.....
1435	Tulare	1891	22.20	22.05	.53	.50	11.00	.227	.43	.45	3.12
1627	Tulare	1892	22.20	21.38	.57	.45	11.09	.185	.58	.50	3.05
1882	Tulare	1893	21.20	19.54	.65	.32	10.03	.221	.48	.52	2.85
2168	Tulare	1894	22.30	21.80	.43	.....	10.58	.298	.55	.35	2.85
1529	Paso Robles	1891	20.05	.....	.51	.45	.....	.....	.....	.....	.....
1745	Paso Robles	1892	20.40	.....	.51	.....	.....	.....	.....	.....	.....

2009	Paso Robles	1893	24.80	24.12	.47	.29	11.91	.480	.48	.47	3.10
	Average, Mission San Jose	------	**21.57**	**20.50**	**.76**	**.39**	**9.66**	**.365**	**.80**	**.49**	**4.37**
	Average, Cupertino	------	**20.90**	------	**.78**	------	------	**.488**	------	------	------
	Average, Tulare	------	**21.97**	**21.19**	**.54**	**.42**	**10.67**	**.232**	**.51**	**.45**	**2.97**
	Average, Paso Robles	------	**21.75**	**24.12**	**.49**	**.37**	**11.91**	**.480**	**.48**	**.47**	**3.10**
	Alicante Bouschet.										
1241	Fresno	1890	22.15	20.61	.71	.42	11.27	.214	------	.53	2.82
1396	Cupertino	1890	25.90	------	1.02	------	------	------	------	------	------
2046	Cupertino	1893	23.70	------	1.25	------	------	.604	1.31	------	------
2112	Cupertino	1893	23.10	------	1.03	------	------	.474	.83	------	------
1581	Mission San José	1891	24.35	22.67	.77	.43	11.91	.398	.72	.50	3.05
1790	Mission San José	1892	23.70	------	.81	------	------	------	------	------	------
	Average, Cupertino	------	**24.23**	------	**1.10**	------	------	**.539**	**1.07**	------	------
	Average, Mission San Jose	------	**24.00**	**22.67**	**.79**	**.43**	**11.91**	**.398**	**.72**	**.50**	**3.05**

NORTH ITALIAN TYPE—RED.

(See Vit. Rept. 1887-89, p. 117.)

The judgment expressed in the last report regarding the grapes of the North Italian type has been but slightly modified by later experiments. Some of the finer varieties, such as the Nebbiolo and Bonarda, while making excellent wines of their class, have not borne sufficiently to be recommended for any of the localities yet tried. Certain others, such as the Dolcetto, while bearing well, have not shown sufficient quality to encourage their dissemination. The Marzemino is worthy of further study. The varieties which have given the best results are the Refosco ("Crabb's Burgundy"), Barbera, and Fresa. The first of these shows the widest adaptability, producing well and giving good wine, both in the coast counties and in the interior valleys. It is especially promising for the San Joaquin Valley, where, together with the Barbera and the Tinta Valdepeñas, very good results have been obtained in the production of dry, red wines. The Barbera has not succeeded well in the coast counties, and, except perhaps in some extra hot location, is not to be recommended for that region. The Fresa has done well at Cupertino and at Paso Robles, and would doubtless be successful in other parts of the lower coast counties. It has, however, a very marked flavor, somewhat resembling that of Zinfandel, which many people would not find agreeable and it would therefore be inadvisable to plant it too freely.

The especial advantage possessed by the North Italian type of grapes is that they supply a large proportion of acid together with high sugar content, and that they resist exposure on the vines remarkably well and supply bunches sound throughout. They are therefore desirable for wine-making in hot climates, not only by themselves, but especially for blending with other varieties whose acid content falls so low under the influence of heat as to jeopardize sound fermentation and produce flavorless wines.

NEBBIOLO.

(See Vit. Rept. 1885-86, p. 87; 1887-89, p. 127.)

A full description of this variety is given in the places cited, and later results have confirmed the opinions expressed there. The vine is healthy, but a small grower, and with its small leaves is apt to allow the grapes to sunburn. The wine is of excellent quality, but lacking in color, and not sufficiently superior to other of the Italian varieties to make up for its deficiency in bearing. In all the localities tried the must is characterized, like that of most of the North Italian varieties, by its high acidity and high sugar. At Tulare and at Paso Robles stations, however, the acidity is lower than in the case of Barbera. The color is irregular, like that of the Aramon. Occasionally in the Bay region it will be sufficient and of fairly good tint, but generally it is very light and yellowish.

ANALYSES OF MUSTS AND WINES.

NEBBIOLO (FINO, BOURGU, ETC.).	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At 6 to 8 Months	Body
1890—No. 1285. Cupertino	Oct. 1	22.80	.....	.82	.22	.....	.....	.....	.....	.....	.....
No. 1364. Cupertino	Oct. 14	23.70	.....	.96	.....	.....	.....	.....	.....	.....	.....
1891—No. 1575. Asti, Sonoma County	Oct. 8	*26.90	27.65	.45	.26	11.08	13.54	.281	.69	.50	3.20
1892—No. 1695 (Fino). Tulare	Sept. 27	22.80	.....	.80	.....	.....	.....	.....	.....	.....	.....
No. 1700 (Bourgu). Tulare	Sept. 27	25.40	.....	.41	.....	.....	.....	.....	.....	.....	.....
1893—No. 1857 (Fino). Amador station	Sept. 14	20.60	.....	1.15	.....	.....	.....	.....	.....	.....	.....
No. 1858 (Bourgu). Amador station	Sept. 14	20.20	.....	1.07	.....	.....	.....	.....	.....	.....	.....
No. 1938 (Bourgu). Paso Robles	Oct. 12	25.90	24.97	.53	.34	.....	.....	.281	.....	.....	.....
No. 2039 (Bourgu). Cupertino	Oct. 30	23.70	.....	1.26	.....	.....	.....	.387	.....	.....	.....
No. 2058 (Fino). Cupertino	Oct. 30	23.30	.....	1.14	.....	.....	.....	.352	.....	.....	.....
1894—No. 2277. Asti, Sonoma County	Oct. 6	22.20	21.38	.99	.31	.....	.....	.....	.....	.....	.....

* Added water and tartaric acid before fermentation.

RECORD OF TREATMENT.

No. 1285. *Nebbiolo*, from Cupertino. A sample for must analysis was received October 3, 1890, in good condition, but not quite ripe. The must showed 22.8% of solid contents by spindle and 0.82% of acid.

No. 1364. *Nebbiolo bourgu*, from Cupertino. A sample for must analysis was received October 17, 1890, in good condition, and mature. The must showed 23.7% of solid contents by spindle and 0.96% of acid.

No. 1575. *Barolo*, from Asti, Sonoma County. Received October 10, 1891, in good condition, and mature, a few of the grapes beginning to dry. The grapes were apparently identical with the Nebbiolo fino. The must showed 26.9% of solid contents by spindle and 0.45% of acid. The temperature of the grapes at crushing was 63°. One hundred and four pounds were crushed and put to ferment with an addition of 68 grs. of tartaric acid and ¾ gal of water. The maximum temperature reached was 85°, on the fourth day. The must fermented slowly, but was dry on the seventh day, when it was drawn off.

At one month the wine was clear, of full and agreeable flavor and aroma, and high astringency. At two months it was racked, and at four months the lees were examined and found to be perfectly sound. At five months the wine was bright, with some bouquet and full flavor, high body and astringency, rough, but very promising. An examination of the lees showed them to be perfectly sound. Three months later the wine was in good condition, a heavy-bodied, alcoholic wine, but toned down considerably since last tasting. At fifteen months it was excellent in every respect except in color, which was very light. At sixteen months it was bottled, on account of the smallness of the keg. Two years after bottling the wine was bright, with some bouquet and good flavor, clean taste, and high astringency, much superior to the wine of Mataro of the same year and locality.

No. 1695. *Nebbiolo fino*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 22.8% of solid contents by spindle and 0.80% of acid.

No. 1700. *Nebbiolo bourgu*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 25.4% of solid contents by spindle and 0.41% of acid.

No. 1857. *Nebbiolo fino*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition, but not mature. The must showed 20.6% of solid contents by spindle and 1.15% of acid. The bunches were small, compact, cylindrical; the berries small.

No. 1858. *Nebbiolo bourgu*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. This sample seems to be identical with No. 1857. The must showed 20.2% of solid contents by spindle and 1.07% of acid.

No. 1938. *Nebbiolo bourgu*, from Paso Robles station. A sample for must analysis was received October 13, 1893, in good condition, sweet and mature. The bunches were of good size, conico-cylindrical, close; the berries round, reddish, and very juicy. The must showed 25.9% of solid contents by spindle and 0.53% of acid. The vines were grown in sandy soil, pruned long, and bore at the rate of about one ton per acre.

No. 2039. *Nebbiolo bourgu*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition, and mature. The bunches were under medium size, cylindrical, with small wings, well filled; the berries small, very acid. The must showed 23.7% of solid contents by spindle and 1.26% of acid.

No. 2058. *Nebbiolo fino*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were of medium size, long cylindrical, with a small wing, close; the berries of medium size, round, well colored, crisp, juicy, with good acid, and mature. The must showed 23.3% of solid contents by spindle and 1.14% of acid.

BARBERA.

(See Vit. Rept. 1883–85, p. 111; 1885–87, p. 85; 1887–89, p. 134.)

The last experiments with the Barbera have been principally with grapes from the Tulare station, to which locality it seems particularly well suited. The vines of this variety are there planted in sandy soil where the alkali is not very strong, and they make a strong and healthy growth. They produce about five tons per acre of fine, clean grapes. The grapes are thick-skinned, not too close, and very resistant to injuries from any source. They are firm, juicy, fresh-tasting, and ripen well

without losing their acid. The average composition of the must for four years has been 24% of solid contents, and 0.76% of acid—an excellent ratio between sugar and acid, insuring good fermentation. This is a lower ratio of acid to sugar than is given by the same grape in cooler localities, but is well up to the average, and better than is given by any other grape yet tried at Tulare. In tannin it falls much below the amount obtained from it in other localities, an average of 0.173% compared to 0.274% at Cupertino.

The first wine made from this variety at Tulare, while the vines were young, was lacking in color, but was of good quality and marked character. The wines made after the first year were of good color, acid, and body, but still rather low in tannin. A blend with a grape like Gros Mansenc, St. Macaire, or, best of all, Refosco, is needed to increase the tannin, and improve the keeping qualities. No. 1573 is a good example of the heavy Italian type of wines, with high alcohol and full acid, astringency, and body. This wine, notwithstanding the smallness of the quantity made, was not fully aged at three years and a half.

The Barbera, then, seems to be very well suited to the warmer localities of the State, but requires blending to make a good commercial wine. When grown on warm, hillside soils, such as those of the Asti Vineyard in the upper Russian River Valley, it should be blended with some lighter grape to decrease its roughness and hasten its maturity; but in the rich valley soils, such as those of Tulare, it needs the addition of some robust grape to improve its keeping qualities.

This variety has received a very thorough test at Cupertino, and more especially on Prof. Hilgard's vineyard at Mission San José. At the latter place, as was pointed out in the last report, its chief fault has been irregularity of bearing. Prof. Hilgard has found that its bearing qualities are much better when grafted on Californica stock than when on Riparia.

ANALYSES OF MUSTS AND WINES.

BARBERA.	Date of Picking.	MUST.			Ash.	WINE.						Body.
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.		Alcohol.		Tannin.	Total Acid as Tartaric.			
						By Weight.	By Volume.		At Pressing.	At Six Months.		
1890—No. 1324. Cupertino	Oct. 11	27.65	.....	.50	.....	.....	.....	.....	.....	.....	.....	.....
1891—No. 1445. Tulare	Aug. 26	25.65	.....	.77	.....	.....	.....	.....	.....	.....	.....	.....
No. 1573. Asti, Sonoma County	Oct. 9	28.80	28.52	.75	.40	11.62	14.20	.265	.85	.52	3.25	
1892—No. 1675. Tulare	Sept. 18	24.55	25.76	.65	.71	9.78	12.18	.124	.....	.56	3.20	
1893—No. 1931. Tulare	Oct. 12	23.50	21.22	1.03	.41	9.56	11.91	.192	.89	.58	3.40	
No. 2040. Cupertino	Oct. 30	25.90	.....	1.32	.....	.....	.....	.441	.....	.....	.....	
1894—No. 2211. Tulare	Sept. 28	24.80	23.61	.60	.....	10.07	12.50	.204	.65	.52	3.11	
No. 2276. Asti, Sonoma County	Oct. 6	25.30	24.12	.79	.....	.....	.....	.....	.....	.....	.....	.....

COLOR READINGS.

BARBERA.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1891—No. 1573. Asti, Sonoma County	72.7 2VR	72.7 2VR	50.6 2VR	31.3 3VR	27.0 5VR	.....
1892—No. 1675. Tulare	Color too light for the scale.					
1893—No. 1931. Tulare	90.9 1VR	32.5 1VR	32.0 2VR	25.9 3VR	22.0 4VR	20.1 5VR
No. 2040. Cupertino	129.0 1–2VR	.....	.....	.....	.....	.....
1894—No. 2211. Tulare	46.0 2VR	34.7 1VR	20.5 5VR	18.4 5VR	.....	.....

RECORD OF TREATMENT.

No. 1324. *Barbera*, from Cupertino. A sample for must analysis was received October 13, 1890, in poor condition, quite mature. The must showed 27.65% of solid contents by spindle and 0.50% of acid.

No. 1445. *Barbera*, from Tulare station. A sample for must analysis was received August 29, 1891, in good condition. The must showed 25.65% of solid contents by spindle and 0.77% of acid.

No. 1573. *Barbera*, from Asti, Sonoma County. Received October 10, 1891, in fair condition, quite mature. The must showed 28.8% of solid contents by spindle and 0.75% of acid. The 171 lbs. were crushed on the day of arrival, at a temperature of 62°. The maximum reached was 94°, on the fourth day. The wine was nearly dry on the sixth day and was drawn off on the seventh.

At five weeks the wine was clear, well flavored, and full-bodied; it was very fruity and had a trace of sugar. A month later it was bright and sound; it was racked, and the lees showed no unsoundness. At four months the lees showed a few filaments, but the wine was quite bright, dry, and very good but for a slightly bitter after-taste. At five months it was bright, extremely smooth, and fruity, with rather less tannin than is usual for Barbera, but quite sufficient. It was racked for the third time at ten months, and the lees seemed sound. At sixteen months the wine showed very high quality, but a slightly bitter after-taste. Two months later it was racked and part put in bottle. At twenty-two months it had retained its high quality, and the rest of it was bottled. At three years and a half the bottled wine was bright, not deeply colored, with good bouquet and flavor, clean taste, developing well, but still a little too rough.

No. 1675. *Barbera*, from Tulare station. Received September 21, 1892, in good condition, and mature. The must showed 24.53% of solid contents by spindle and 0.65% of acid. The 114 lbs. were crushed at a temperature of 68°. The maximum reached was 77°, on the third day, when it was racked off.

At one month the wine was clear and clean-tasting, but almost without color. At four months it was bright, agreeable, fruity, almost sweetish, but quite sound. The lees were examined and found to be sound, and the wine was racked for the second time at six months. At nine months it was dry and in good order. At eleven months it was a fair wine, with a marked but not very delicate bouquet. Four months later it had lost nearly all its color, but had kept fairly well. At seventeen months it was bottled.

No. 1931. *Barbera*, from Tulare station. Received October 13, 1893, in good condition. The bunches were of medium size, close, cylindrical; the berries large to medium, oval, firm, but juicy, thick-skinned, mature, with fresh taste and pleasing acid. The weight of grapes crushed was 178 lbs., and the must showed 23.5% of solid contents by spindle and 1.03% of acid. The temperature of the grapes at crushing was 67°, and the maximum reached was 91°, on the third day. The wine was dry on the fifth day, and was pressed on the sixth.

At the end of one month the wine was not quite clear, and still a little sweet. A week later it was racked and taken to the cellar; and at four months it was bright, with some bouquet and flavor, full acid and clean taste. Two months later it had improved, but was still very rough. At ten months the wine was good, but a little flat. An examination of the lees showed the presence of a few filaments. The wine was racked for the third time, and part of it put in bottle. At sixteen months it had changed little from the last tasting; it was a full-bodied, well-colored wine, but not quite clean-tasting. A month later it was racked again and part put in bottle.

No. 2040. *Barbera*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were of medium size, conical, loose, and coulured; the berries of over medium size when not abortive, ripe, but with very high acid. The must showed 25.9% of solid contents by spindle and 1.32% of acid.

BONARDA.

(See Vit. Rept. 1887-89, p. 144.)

For the description of this variety see the above reference. Three distinct varieties have been received and planted at the stations under this name. Like many Italian names, Bonarda is used to designate several varieties of grapes in different localities of Italy. This makes the correct determination of Italian varieties very difficult. One of the varieties which we have received under this name, however, seems to be the true Bonarda of Piedmont and is the one here referred to. It is very similar in character to other North Italian grapes we have tried. It gives excellent color and is characterized by high acid and the rough-

ness of its wine when new. So far, it has not borne very well, but the character of its grapes and wine makes it desirable to experiment with in other localities.

Another variety received under this name is more promising as a table-grape than as a wine-grape. It is a large, round grape, with a full, agreeable flavor, something like that of the true Malvoisies. It seems to be very close to, if not identical with, the Dolcetto as grown at the Swiss-Italian colony of Sonoma County. This latter is one of the most widely grown grapes of northern Italy, where it is highly appreciated on account of its heavy-bearing qualities, and is used both as a table-grape and for the making of common red wines.

Analyses of Musts and Wines.

BONARDA.	Date of Picking.	MUST.				WINE.					
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol.		Tannin.	Total Acid as Tartaric.		Body.
						By Weight.	By Volume.		At Pressing.	At Six Months.	
1890—No. 1362. Cupertino	Oct. 14	22.82	.....	.72	.22	9.41	11.73	.400	.71	.32	2.70
No. 1384. Cupertino	Oct. 21	25.20	.....	1.02	.90	9.92	12.36	.286	.....	.60	2.58
No. 1385. Cupertino	Oct. 19	24.45	.....	1.09	.....	.....	.....	.....	.....	.....	.....
1891—No. 1599. Cupertino	Oct. 23	24.80	.....	.91	.33	9.92	12.36	.356	.83	.83	3.35
1893—No. 1869. Paso Robles	Sept. 13	22.80	19.89	.45	.41	8.06	10.08	.134	.41	.57	2.80
No. 2108. Cupertino	Nov. 1	25.00	.....	.68	.....	.....	.....	.496	.....	.....	.....
No. 2110 (No. 2). Cupertino	Nov. 1	24.80	.....	.78	.....	.....	.....	.253	.....	.....	.....
1894—No. 2310. Tulare	Oct. 13	26.50	.....	.39	.....	.....	.....	.....	.....	.....	.....

Color Readings.

BONARDA.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.
1891—No. 1599. Cupertino	20.9 R	14.7 1R	12.5 3R	13.3 2VR+Y	11.6 3VR+Y
1893—No. 1869. Paso Robles	8.6 3R	9.0 3R	.....	.....	.....
No. 2108. Cupertino	97.5 VR–1VR	.....	.....	.....	.....
No. 2110. Cupertino	15.4 5VR	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1362. *Bonarda*, from Cupertino. Received October 17, 1890, in good condition, and mature. The must showed 22.82% of solid contents by spindle and 0.72% of acid. There were 126 lbs. crushed, the initial temperature being 64°; the maximum reached was 82°, on the third day. On the fifth day the wine was nearly dry, and was drawn off.

At one month the wine was nearly clear, of deep color, without aroma, with very high astringency and medium acid, still very raw and undeveloped. One month later the lees were examined, found to be in good condition, and the wine was racked. At three months it was bright, with light bouquet and good flavor, remarkably high astringency, good body and vinosity; in general, very rough, but promising. An examination of the lees showed the presence of some short filaments, and though the taste was unaffected, the wine was pasteurized. Three months after pasteurizing it was bright, still very rough, but of excellent flavor and general quality. At seven months it was racked for the third time. At fourteen months it was in good order, of deep color, good flavor and bouquet, and was maturing well. At seventeen months it was racked and part put in bottle; at twenty-three months the rest was bottled. At three years and three months both samples were sound, but not clear, very rough, and had deposited much sediment.

No. 1384. *Bonarda No. 2*, from Cupertino. This grape is distinct from the Bonarda numbered 1362, and is apparently the Bonarda di Gattinara or Uva Rara, with the description of which in Pulliat and Rovasenda it agrees. The grapes were received October 23, 1890, and 172 lbs. were crushed. The must showed 25.2% of solid contents by spindle and 1.02% of acid. The temperature of the grapes at crushing was 68°, and the maximum reached was 92°, on the third day. The wine was still a little sweet on the fourth day, when it was racked.

At one month the wine was clear, and showed very high acid and astringency. At two months it was racked, and the lees were sound. At three months the lees showed a few filaments, but the wine was bright, with very good bouquet and flavor, and clean taste; it was, however, pasteurized for safety. At seven months it was bright and showed high quality; it was still rough, but had commenced to mature. At eight months it was racked for the third time. At fifteen months it was in good order, with fair but yellowish color, full rich bouquet and flavor, clean taste, high astringency, and good body. It was nearly mature, and two months later it was racked and part put in bottle; at twenty-five months the remainder was bottled. At three years and three months both bottled samples were bright and in first-class order. That first bottled was of better color and fresher taste than the second, but not so smooth; both were very good wines, but somewhat lacking in color, and rather rough.

No. 1385. *Bonarda No. 1*, from Cupertino. This grape was received under the name of Provinante; it is probably the Pruiné, as it agrees very closely with the description of that variety as given by Rovasenda. The grapes were received October 21, 1890, in good condition, and mature. The must showed 24.45% of solid contents by spindle and 1.09% of acid. Only a sample for must analysis was received.

No. 1599. *Bonarda*, from Cupertino. Received October 24, 1891, in good condition. The must showed 24.8% of solid contents by spindle and 0.91% of acid. There were 47 lbs., which were crushed at a temperature of 66°; the maximum reached was 75°, on the sixth day. On the ninth day the wine was drawn off while still a little sweet.

Three weeks after pressing the wine was clear, dry, with high acid and astringency. At four months the wine was racked for the second time, and the lees were sound. At five months the wine was bright, with full bouquet and flavor, very rough, but of excellent promise. The lees were examined and found to be sound, and two months later the wine had improved, and although still crude was of great solidity and promise. At eight months it was racked for the third time.

No. 1869. *Bonarda*, from Paso Robles station. A small sample was received September 15, 1893, in good condition. The bunches were over medium in size, conico-cylindrical, very compact; the berries were of medium size, well colored, and very sweet. The must showed 22.8% of solid contents by spindle and 0.45% of acid. The grapes were fermented for color and tannin tests.

No. 2108. *Bonarda*, from Cupertino. A sample for must analysis was received November 1, 1893, in good condition. The bunches were over medium in size, long cylindrical, winged, and well filled; the berries were of medium size, round, thick-skinned, and very sweet. The must showed 25.0% of solid contents by spindle and 0.68% of acid.

No. 2110. *Bonarda No. 2* (Uva Rara), from Cupertino. A sample for must analysis was received November 1, 1893, in good condition. The bunches were large, conical, heavily shouldered, compact; the berries were over medium in size, pulpy, very sweet, but with high acid. This variety bears great resemblance to No. 2111, Dolcetto, but the berries are not so hard and have less of the distinctive flavor. (Nos. 2110 and 2111 are probably identical. Prof. Hilgard.)

FRESA.

(See Vit. Rept. 1887-89, p. 149.)

The best results with this variety so far have been obtained at the Cupertino and the Paso Robles stations. At the former the average composition of the must has been 24.8% of sugar and 0.77% of acid—a lower percentage of acid than has been obtained with most of the other Italian varieties. At Paso Robles station the ratio of acid to sugar has been still lower, but quite sufficient; at Tulare, the acid percentage has been rather low, and as the vines have borne poorly they seem unsuited to that locality. From all localities the wine has heavy body and high astringency. It has a very marked and peculiar flavor, coarse but not unpleasant, something of the same nature as the special flavor of the Zinfandel, rendering it unsuitable for blends where a neutral wine is desired. Like the other Italian wines it is at first very rough, and even slower to mature than the others, and even with aging it does not attain the delicacy of the Nebbiolo or the Barbera. The color of the wine is somewhat yellowish, and, except at Cupertino, is insufficient in intensity. Of the localities tested, the Fresa seems to be best suited to Paso Robles, where, with the help of some color grape, it could be used for the production of a common wine of rather better character and keeping qualities than that of the Zinfandel.

Analyses of Musts and Wines.

FREISA DI MONFERRATO, OR FRESA.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar Test by Copper	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1890—No. 1327. Cupertino	Oct. 11	23.90	.....	.94	.21	9.78	12.18	.451	.97	.53	3.08
1891—No. 1469. Fresno	Aug. 29	28.20	28.33	.50	.50	11.46	14.00	.....	.80	.50	3.82
No. 1553. Paso Robles	Oct. 6	25.90	.....	.43	.....	.....	.....	.....	.....	.....	.....
No. 1600. Cupertino	Oct. 20	25.20	24.64	.77	.45	9.99	12.46	.440	.....	.70	3.05
1892—No. 1643. Paso Robles	Sept. 13	24.14	.....	.76	.....	.....	.....	.....	.....	.....	.....
No. 1703. Tulare	Sept. 27	24.35	.....	.41	.....	.....	.....	.....	.....	.....	.....
1893—No. 1830. Amador station	Sept. 7	20.40	.....	.89	.22	.....	.....	.461	.....	.....	.....
No. 1913. Paso Robles	Oct. 4	24.80	23.61	.66	.68	9.63	12.00	.285	.70	.43	2.80
No. 1976. Tulare	Oct. 4	27.35	.....	.38	.31	.....	.....	.....	.....	.....	.....
No. 2130. Cupertino	Nov. 1	25.20	.....	.88	.....	.....	.....	.265	.....	.....	.....
1894—No. 2175. Amador station	Sept. 24	23.70	.....	.68	.....	.....	.....	.....	.....	.....	.....
No. 2318. Tulare	Oct. 15	24.80	.....	.41	.....	.....	.....	.....	.....	.....	.....

Color Readings.

FRESA.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1890—No. 1327. Cupertino						
1891—No. 1469. Fresno	24.0 4VR+Y	17.4 4VR+Y	11.9 1R+Y	11.1 1R+Y	10.4 1R+Y	10.4 3R+Y
No. 1600. Cupertino	78.4 5VR	37.0 R	37.0 R–1R	30.5 1R	.....	.....
1893—No. 1830. Amador station	33.9 R	33.1 3VR	.....	.....	.....	.....
No. 1913. Paso Robles	23.6 4VR	33.3 3VR	19.5 R	18.3 R	17.5 1R	10.6 3R
No. 2130. Cupertino	42.1 5VR	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1327. *Fresa*, from Cupertino. Received October 13, 1890, in good condition. The must showed 23.9% of solid contents by spindle and 0.94% of acid. There were 191.5 lbs. crushed. The temperature at crushing was 65°, and the maximum reached was 92°, on the fourth day. On the fifth day the wine was still a little sweet, and was drawn off on the sixth.

At three weeks the wine was clear and showed very high acid and astringency. At two months, when the wine was racked for the second time, the lees were sound. At three months the lees showed a few short filaments, and the wine was pasteurized. When pasteurized it was bright, with good, deep color, marked but not delicate aroma and flavor, high astringency, full acid, good body and alcohol. It was a good, solid wine, but a little rough and coarse. Two months after pasteurizing it was bright and developing, but rough, heavy, and extremely astringent. At fifteen months it was in good order, of deep garnet color, with some bouquet, good flavor, and clean taste. It was much smoother and nearly mature. At seventeen months it was racked for the fifth time, and part bottled; at twenty-three months the rest was bottled. At three years and three months both samples were in excellent condition, of good color and body, well flavored, and with little bouquet; the second bottling was smoother than the first, and generally more pleasing.

No. 1469. *Fresa*, from Fresno. Received August 31, 1891, in fair condition, a little dried. The must showed 28.2% of solid contents by spindle and 0.50% of acid. There were 44.75 lbs. crushed. The temperature at crushing was 70°, and the maximum reached was 81°, on the fourth day. The wine was drawn off on the seventh day while still a little sweet.

At two weeks the wine was cloudy and still slightly sweet, but at one month it was clear and almost dry. At six weeks it was bright, with good color, full flavor and aroma, clean taste, and high astringency—a very promising wine. At three months it was racked for the second time, and an examination of the lees showed them to be sound. At this time it was clear, sound, and good, but still had a trace of sweetness. At five months it was still very rough, but clean-tasting and fruity. The lees were sound, and at seven months the wine was smoother and much improved; it was a rich, fruity wine, and had kept remarkably well for such a small sample (two gallons). The sample being so small, it was bottled at this date. At three years and a half the bottled wine was clear, but had made a heavy deposit; it was a very good, clean-tasting wine, with some flavor and bouquet, altogether one of the best table-wines made from Fresa, but was bottled too soon.

No. 1553. *Fresa*, from Paso Robles station. Received October 8, 1891, in good condition. The bunches were small, the berries of medium size and mature. The must showed 25.9% of solid contents by spindle and 0.43% of acid. Only a sample was received for must analysis.

No. 1600. *Fresa*, from Cupertino. Received October 21, 1891, in fair condition, with many small berries and also half-dried ones. The must showed 25.2% of solid contents by spindle and 0.77% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 81°, on the third day. The wine was dry on the fifth day, when it was drawn off.

In one month the wine was clear and of good quality, except that the odor was not good. At four months it was bright, well defecated, of good quality, but very astringent; the lees were sound and the wine was racked for the second time. It remained bright and sound, but was still very rough when racked for the third time at ten months. At fifteen months it was in good order, with somewhat coarse but not disagreeable odor, and the special flavor of the Fresa very pronounced. It was still very rough and not mature, but was bottled, as the quantity was too small to keep longer. At three years and four months the bottled wine was bright—an extremely rich, full wine, but rather coarse and too heavy and solid to be used alone. It had evidently been bottled before it was mature.

No. 1643. *Fresa*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 24.14% of solid contents by spindle and 0.76% of acid.

No. 1703. *Fresa*, from Tulare station. A sample for must analysis was received September 29, 1892, in fair condition. The must showed 24.34% of solid contents by spindle and 0.41% of acid.

No. 1830. *Fresa*, from Amador station. A sample for must analysis was received September 8, 1893, in good condition, but not quite mature. The bunches were small, rounded, and well filled; the berries were small and of reddish color. The must showed 20.4% of solid contents by spindle and 0.89% of acid.

No. 1913. *Fresa*, from Paso Robles station. Received October 6, 1893, in good condition. The bunches and berries were small, but with good characteristic flavor. The must showed 24.8% of solid contents by spindle and 0.66% of acid. The grapes came from long-pruned vines growing on sandy soil, and were produced at the rate of about three tons per acre. There were 207 lbs. crushed. The temperature of the must at

crushing was 63°, and the maximum, reached the fourth day, was 91°. The wine was not quite dry when it was drawn off on the sixth day.

In three weeks the wine was nearly clear, but very rough. At six weeks it was clear, of good flavor, and with a slight sweetness. At four months it was bright, quite dry, with some bouquet, good flavor, medium acid, high astringency—a very promising wine. At this time it was racked for the second time. Three months later it was still very rough, but showed excellent keeping qualities. At sixteen months it was in good order, with marked and characteristic aroma and flavor—a full, rich wine, but lacking in delicacy. An examination of the lees showed them to be perfectly sound. A month later the wine was racked and part put in bottle.

No. 1976. *Fresa*, from Tulare station. A sample for must analysis was received October 6, 1893, in good condition. The bunches were very small, short, cylindrical, close; the berries were under medium in size, round, astringent, juicy, with very thick, tough skin, overripe, and much shriveled. The must showed 27.45% of solid contents by spindle and 0.38% of acid. The vines from which this sample came were growing in alkali soil, pruned half-long, and bore at the rate of about four tons to the acre.

No. 2130. *Fresa*, from Cupertino. A sample for must analysis was received November 1, 1893, in good condition. The bunches were of medium size, conico-cylindrical, compact, with small shoulders; the berries were crisp, pulpy, with thick but tender skin, high acid, but mature. The must showed 25.2% of solid contents by spindle and 0.88% of acid.

MORETTO.

Synonyms: Croetto; Lambrusca.

Description.—Vigorous and productive, with strong, somewhat erect canes; leaves large, somewhat downy below, of irregular shape, with or without sinuses, teeth short, veins reddish; bunches small to over-medium, close, short cylindrical, occasionally winged; berries over the average in size, round, thick-skinned, firm, juicy, with neutral flavor.

This variety is extensively cultivated on the plains of Alexandria, in northwestern Italy. It is valued on account of its fertility and its resistance to spring frosts. It is a good, healthy vine, accommodating itself to almost any soil or exposure. Its wine is not considered of high quality. Contrary to the results in Italy, the Moretto, as grown at the stations, has shown itself a poor bearer. The wine has always been unsatisfactory and of very poor keeping qualities. It is, therefore, a variety which cannot at present be recommended for any locality. There are several variations of this variety which are at present being tested; it is, therefore, possible that one of these may prove as satisfactory as they have done in Italy.

ANALYSES OF MUSTS AND WINES.

MORETTO.	Date of Picking.	MUST. Solid Contents by Spindle.	MUST. Sugar by Copper Test.	MUST. Acid as Tartaric.	MUST. Ash.	WINE. Tannin.
1892—No. 1633. Tulare	Sept. 4	24.01	.....	.62	.....	.....
1893—No. 1852. Amador station	Sept. 13	19.70	.....	.77	.....	.208
No. 1889. Tulare	Sept. 1	22.40	21.22	.38	.59	.224
No. 1906. Tulare	Oct. 2	23.25	20.24	.75	.32	.....
No. 1926. Paso Robles	Oct. 12	24.60	23.32	.43	.35	.214
1894—No. 2177. Amador station	Sept. 24	24.70	.....	.56	.....	.....
No. 2215. Paso Robles	Sept. 28	22.80	.....	.68	.....	.....
No. 2319. Tulare	Oct. 15	26.30	.....	.53	.....	.....

RECORD OF TREATMENT.

No. 1633. *Moretto*, from Tulare station. A sample for must analysis was received September 6, 1892, in good condition. The must showed 24.01% of solid contents by spindle and 0.62% of acid.

No. 1852. *Moretto*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The bunches were of medium size, very compact; the berries of medium size, thick-skinned, fleshy, fairly well colored, and with some flavor. The must showed 19.7% of solid contents by spindle and 0.77% of acid.

No. 1889. *Moretto*, from Tulare station. A sample for must analysis was received September 2, 1893, in good condition. The bunches were very small, short-cylindrical, not shouldered, but occasionally with a small wing; the berries of good size, round, close together but not compressed, thick-skinned, firm but juicy, mature, but with little flavor. The must showed 22.4% of solid contents by spindle and 0.38% of acid.

No. 1906. *Moretto*, from Tulare station. Received October 2, 1893, in good condition. The bunches were small and close; the berries of over average size, very sweet. The grapes were very thick-skinned, and some of them were dry. The must showed 23.25% of solid contents by spindle and 0.75% of acid. The temperature of the grapes at crushing was 70°, and the maximum, reached on the third day, was 90°. The wine was nearly dry on the fifth day, when it was pressed.

The wine was rough and sharply acid. It remained cloudy for a long time, and never became clean-tasting. It was racked several times, and finally became bright, but was flat and unpleasing. It did not keep well, and was altogether a very unsatisfactory wine.

No. 1926. *Moretto*, from Paso Robles station. A sample for must analysis was received October 12, 1893, in good condition. The bunches were of good size, compact, and shouldered; the berries of medium size, well colored, very sweet, and commencing to dry up. The must showed 24.6% of solid contents by spindle and 0.43% of acid.

No. 2136. *Croetto*, from Cupertino. A sample for must analysis was received November 7, 1893, in good condition. The bunches were small, close, abruptly conical; berries small, round, crisp and juicy, with thick skin. The grapes were very sweet and some of them were dry. The must showed 24.7% of solid contents by spindle and 0.68% of acid.

FAVORITA.

This variety is cultivated to a limited extent in Piedmont at Rivoli. Judging by the one sample received from Cupertino it possesses in a high degree the characteristics of the North Italian grapes.

RECORD OF TREATMENT.

No. 2123. *Favorita*, from Cupertino. A sample for must analysis and color test was received November 7, 1893, in good condition. The bunches were of medium size, conical, sometimes elongated, loose, and with wings, on slender peduncles; berries of medium size, round, crisp, with thin but tough skin, on very slender pedicels. The grapes were ripe, but very acid. The must showed 24.8% of solid contents by spindle and 1.04% of acid.

TADONE.

Synonyms: Tadon Nero; Cari; Carola.

Description.—Leaves thick, five-lobed, coarsely toothed, hairy below; bunches large, long conico-cylindrical, well filled, on long, slender peduncles; berries of medium size, round, on slender pedicels, without special flavor. The grapes ripen rather late and the vine requires long-pruning.

The grapes are grown to a limited extent in several parts of Piedmont, where they are used both for wine-making and for the table. They give an alcoholic wine with good color.

RECORD OF TREATMENT.

No. 2106. *Tadone*, from Cupertino. A sample for must analysis was received November 7, 1893, in good condition. The bunches were of medium size, variable in shape (conical, conico-cylindrical, or double), on slender, herbaceous peduncles, well filled but not compact; berries medium to small, round, juicy and rather soft, with thick but tender skin, pedicels slender; flavor not marked, but sweet and with good acid. The must showed 23.1% of solid contents by spindle and 0.94% of acid.

NEIRETTA.

Synonyms: Costiole; Fresa di Nizza.

Description.—Vine vigorous and prolific; leaves large, smooth above, woolly below, very slightly lobed; bunches large, conical, winged, close; berries medium in size, round, thick-skinned, and ripening late.

This variety is cultivated largely in Piedmont, especially in the neighborhood of Saluzzo. It is valued on account of its vigor and heavy bearing. It produces a fair and well-colored wine, but not of high quality or of very good keeping qualities. It does well with short-pruning, especially when the vine is trained on trellis or wires.

RECORD OF TREATMENT.

No. 2135. *Neiretta*, from Cupertino. A sample for must analysis was received November 7, 1893, in good condition. The bunches were of medium size, conical, close, with a small wing; berries medium to small, round, soft, juicy, thick-skinned, mature, and very fresh-tasting. The must showed 22.4% of solid contents by spindle and 0.68% of acid.

REFOSCO.

(See Vit. Rept. 1883–85, p. 93; 1885–86, p. 78; 1887–89, p. 155.)

Synonyms: Raboso; Crabb's Black Burgundy; "Petit Pinot" of some.

The identity of Refosco and Crabb's Black Burgundy may be considered as established; their respective modes of growth and the composition of their respective wines are indistinguishable. They are, therefore, treated here under one head, and the analyses of their wines appear in the same table. The wine, though of the same general character as that of most of the Piedmontese grapes which have been tried in California, is less rough and develops more quickly. The average composition of the

must and wine, according to analyses made at the station for a series of years, has shown:

	Solid Contents by Spindle.	Acid.	Tannin.
From Cupertino	24.35%	.50%	.282%
From Mission San José	24.25	.64	.248
From San Joaquin Valley	22.46	.50	.276
From Paso Robles	20 98	.60	.218
From Sonoma	25.90	.45	.257

This shows (except at Paso Robles where the vines are young) good sugar contents and sufficient but not excessive acid; the tannin also is full, but not, as a rule, enough to make the wine excessively rough. The wine has always been full-bodied and with excellent color. It is one of the vines which are most promising for the production of dry red wines in districts resembling the lower San Joaquin Valley. Even at Tulare, where the production of a sufficiently colored wine is exceptionally difficult, it has always given good color and occasionally enough to make it valuable for blending with wines lacking in color.

ANALYSES OF MUSTS AND WINES.

REFOSCO.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At 6 to 8 Months	Body
1890—No. 1287 (C. B. B.). Cupertino	Oct. 1	23.90	.....	.55	.27	.....	.....	.....	.....	.....	.....
No. 1316. Mission San José	Oct. 8	27.55	.....	.71	.....	.....	.....	.....	.....	.....	.....
No. 1318 (C. B. B.). Cupertino	Oct. 11	25.20	.....	.62	.34	10.81	13.27	.244	.66	.42	2.78
No. 1343 (C. B. B.). Mission San José	Oct. 11	26.50	.....	.63	.22	10.81	13.27	.264	.....	.45	3.32
No. 1390. Cupertino	Oct. 18	24.12	.....	.55	.....	.....	.....	.....	.....	.....	.....
No. 1416. Cupertino	Oct. 28	29.50	.....	1.06	.28	11.77	14.40	.363	1.12	.54	.....
1891—No. 1496 (C. B. B.). Paso Robles	Sept. 13	19.30	18.30	.47	.31	7.78	9.73	.170	.46	.30	2.80
No. 1516 (C. B. B.). Mission San José	Oct. 1	24.45	24.53	.74	.....	9.70	12.09	.220	.75	.35	3.04
No. 1526 (C. B. B.). Asti, Sonoma County	Oct. 5	25.30	24.12	.39	.33	10.26	12.77	.294	.55	.41	2.95
No. 1584. Mission San José	Oct. 13	24.45	22.67	.50	.....	9.63	12.00	.220	.48	.70	3.45
1892—No. 1615 (C. B. B.). Tulare	Aug. 26	21.50	18.58	.48	.30	7.92	9.90	.270	.43	.39	3.05
No. 1650 (C. B. B.). Paso Robles	Sept. 13	21.75	.....	.75	.....	.....	.....	.....	.....	.....	.....
No. 1707 (C. B. B.). Mission San José	Oct. 4	22.80	22.05	.67	.29	8.98	11.18	.229	.63	.49	2.85
No. 1785. Mission San José	Oct. 19	23.50	.....	.57	.....	9.05	11.27	.198	.65	.44	2.80
1893—No. 1884 (C. B. B.). Paso Robles	Sept. 19	21.90	19.89	.58	.28	7.92	9.90	.266	.60	.58	2.85
No. 1930 (C. B. B.). Tulare	Oct. 12	22.85	21.47	.41	.49	8.84	11.00	.268	.49	.42	2.60
No. 1949. Mission San José	Oct. 12	23.70	.....	.63	.....	.....	.....	.358	.....	.....	.....
No. 2053. Cupertino	Oct. 29	26.50	.....	.43	.....	.....	.....	.323	.....	.....	.....
No. 2107 (C. B. B.). Cupertino	Nov. 5	25.90	.....	.42	.....	.....	.....	.425	.....	.....	.....
No. 2117. Cupertino	Nov. 5	26.30	.....	1.07	.....	.....	.....	.432	.....	.....	.....
1894—No. 2171 (C. B. B.). Tulare	Sept. 24	24.00	23.42	.41	.....	9.12	11.36	.291	.40	.51	3.10
No. 2268. Mission San José	Oct. 5	22.40	.....	.47	.....	.....	.....	.173	.....	.....	.....
No. 2302. Mission San José	Oct. 12	23.10	.....	.43	.....	.....	.....	.....	.....	.....	.....

COLOR READINGS.

REFOSCO.	At Pressing.		One Month.		Two Months.		Three Months.		Four Months.		Five Months.		Six Months.	
1890—No. 1318. Cupertino														
No. 1343.* Mission San José	46.5	1VR												
No. 1416. Cupertino														
1891—No. 1496. Paso Robles	46.5	1VR	14.1	4VR	14.1	5VR	13.2	5VR	7.7	3R	8.3	3R		
No. 1516. Mission San José	166.0	1VR	64.5	1VR	26.5	5VR	23.9	5VR	18.0	R	15.5	1R		
No. 1584. Mission San José	160.0	VR	44.0	1VR	49.4	2VR	50.0	3VR	34.2	3VR				
1892—No. 1615. Tulare	21.0	3VR	12.5	4VR	9.8	1R	9.7	3R	8.7	2R	8.3	2R	7.6	2R
No. 1707. Mission San José	174.0	VR	75.5	1VR	74.2	2VR	62.0	2VR	43.9	2VR	36.7	2-3VR		
No. 1785.† Mission San José	105.0	VR	71.6	2VR	42.5	4VR	26.0	5VR	24.4	5VR				
1893—No. 1884. Paso Robles	90.9	VR	54.1	VR	50.6	1VR	34.8	1VR	29.6	1VR	24.4	2VR		
No. 1930. Tulare	60.6	VR	30.3	1VR	17.2	2VR	17.8	3VR	17.6	3VR	11.6	5VR		
No. 1949. Mission San José	83.3	VR												
No. 2053. Cupertino	52.0	2VR												
No. 2107. Cupertino	74.2	VR-1VR												
No. 2117. Cupertino	160.0	1-2VR												
1894—No. 2171. Tulare	42.1	1-2VR	31.7	1VR	31.7	1VR	24.4	3VR						
No. 2268. Mission San José	46.0	VR												

* Blend.
† Blend of Refosco and Marzemino.

RECORD OF TREATMENT.

No. 1287. *Refosco*, from Cupertino. Received October 3, 1890, in bad condition; the bunches showed much coulure. The grapes were ripe, but too few for wine. The must showed 23.9 % of solid contents by spindle and 0.55% of acid.

No. 1316. *Refosco*, from Mission San José. Received October 10, 1890, in a much bruised condition. The sample was small and was fermented as a color test. The must showed 27.55 % of solid contents and 0.71% of acid.

No. 1318. *Refosco*, from Cupertino. Received October 13, 1890, in rather poor condition. The must showed 25.2% of solid contents by spindle and 0.62% of acid. Two hundred pounds of grapes were crushed, commenced to ferment at a temperature of 65°, and reached a maximum of 92° on the fourth day. The wine was dry on the fifth day, and was pressed on the sixth.

The wine remained turbid and fermented slowly for a month. In two months it was clear, but had a slightly suspicious odor, and was pasteurized at 160°. An examination of the lees showed some filaments. The wine at this time was smooth, of low acid and full astringency, generally of good quality but for slight lactic taint. The wine after this improved, but never quite lost its disagreeable odor, and at fifteen months was bright and of good color, showed good qualities, but also some volatile acid. At seventeen months it was bottled, but did not keep well.

No. 1343. *Refosco*, from Mission San José. Received October 14, 1890, in poor condition, but mature. The must showed 25.2% of solid contents by spindle and 0.63% of acid. The grapes were fermented with No. 1344, an unknown red grape from Mission San José. The temperature of the must at crushing was 65°, and the maximum reached was 96°, on the fourth day. On the fifth day the wine was nearly dry, and was drawn off on the sixth.

At the end of a month the wine was cloudy and still a little sweet. In two months it was clear, smooth, clean-tasting, with some flavor, aroma, and full astringency; it still contained a little sugar. At the first examination the lees were sound, but at four months they showed a few filaments, so the wine was pasteurized. At this date the wine was clear, with a little flavor and bouquet, but a slight moldy taste, and altogether not of high quality. At seven months it had improved, and was smooth, clear, and heavy-bodied. At fifteen months it was clear, of good color, full acid, little flavor, mature, and of fair quality. At seventeen months it was racked for the fourth time and part of it put in glass; the remainder was bottled at twenty-two months, but none of it improved in bottle.

No. 1390. *Refosco*, from Cupertino. A sample for must analysis was received October 21, 1890, in fair condition, somewhat overripe. The must showed 24.12% of solid contents by spindle and 0.55% of acid.

No. 1416. *Refosco*, from Cupertino. Received October 30, 1890, in fair condition. The must showed 29.5% of solid contents by spindle and 1.06% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 82°, on the fourth day. The wine was drawn off on the sixth day, while still very sweet.

The wine soon became quite clear, but remained very sweet. The wine never became dry, but remained clear and sound, and showed no injurious ferments in the lees. At three months the wine was clear, clean-tasting, but with a burnt odor.

No. 1496. *Refosco*, from Paso Robles station. Received September 16, 1891, in good condition. The bunches were rather large and loose, with small grapes, not quite mature. The must showed 19.3% of solid contents by spindle and 0.47% of acid. The temperature of the must at crushing was 67°, and the maximum reached was 81°, on the third day. The wine was drawn off on the third day, while still a little sweet.

In three weeks the wine was quite dry and nearly clear. At two months it was clear, very rough, and without much flavor. Tastings at three and at four months showed gradual improvement and the development of some bouquet. The lees showed no bad ferments at first, but at six months they were infested with what was apparently a species of *Mucor*, and the wine had become flat and generally deteriorated. At seven months the wine was racked for the third time. At fourteen months it had improved and was bright, but the odor was still not good. At this time it was mature and was put in glass. At three years and a half the bottled wine was tasted and found to be bright and without deposit, not quite clean-tasting, with little bouquet, but good flavor. The wine showed good qualities, but was not alcoholic enough to be a good keeper.

No. 1516. *Refosco*, from Mission San José. Received October 1, 1891, in good condition. There were 106 pounds crushed, and the must showed 24.45% of solid contents by spindle and 0.74% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 87°, on the fourth day. On the sixth day the wine was drawn off nearly dry.

At one month the wine was clear, with good aroma, clean taste, and full acid. At six weeks the wine was racked and put in the cellar; the lees were sound, but showed some *S. pastorianus*. At three months the wine was clear, but tasted a little flat, and, as the lees showed some filaments, it was pasteurized. Two months after pasteurizing the wine was clear, much improved—a fair wine, of good acid and body. It was racked

twice after pasteurizing, and at ten months part was put in bottle. At sixteen months the rest was bottled. At three years and a half, the wine first bottled was sound, but very raw. The later bottling was bright and of good flavor and a little bouquet—not a fine wine, but a good ordinary wine, with full acid and astringency.

No. 1584. *Refosco*, from Mission San José. Received October 16, 1891, in fair condition. Only 37 lbs. of grapes were crushed. The must showed 24.45% of solid contents by spindle, and 0.50% of acid. The temperature of the grapes at crushing was 69°, and the maximum reached was 81°, on the third day. The wine was drawn off on the fourth day, dry.

At one month the wine was clear, but tasted moldy. At four months it was racked for the second time, and the lees were sound; the taste had not improved, and was slightly bitter. At five months the lees showed a little "graisse," but at seven months the wine had improved, and the taste of mold had almost disappeared. On account of the smallness of the sample (two gallons) the wine was bottled at seven months. Three years after bottling the wine was bright, of good color, high bouquet, and good flavor, perfectly sound, but with somewhat harsh acid, and not quite fresh-tasting. It was, however, remarkably well kept, considering the smallness of the original sample.

No. 1615. *Refosco*, from Tulare station. Received August 29, 1892, in very good condition, mature, and with a few half-dried grapes. There were 290.5 lbs. crushed and put in the fermenting-vat at a temperature of 65°. The must showed 21.5% of solid contents by spindle and 0.48% of acid. The maximum temperature reached was 95°, on the sixth day. On the seventh day the wine was drawn off dry.

At one month the wine was very clear, rough, clean-tasting, and perfectly dry. At four months it was bright, with rich aroma and flavor, medium acid, and high astringency. At six months it was racked for the second time and was in good condition, and retained its good quality. Tastings at nine, eleven, and sixteen months showed gradual improvement and development. At the last date it was bright, nearly mature and one of the best of the Tulare wines. Four months later the wine was bottled. At two years and a half the wine in bottle was bright, with sufficient color, some bouquet and flavor, very clean-tasting, with low acid, high astringency; altogether a very creditable table wine alone, but would make an excellent blend with some acid, highly flavored wine of Claret type. This wine was distinguished particularly from most Tulare wines by its exceptionally clean after-taste; it was distinctly a wine "che finisce bene."

No. 1650. *Refosco*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 21.75% of solid contents by spindle and 0.75% of acid.

No. 1707. *Refosco*, from Mission San José. Received October 5, 1892, in fair condition. The must showed 22.8% of solid contents by spindle and 0.67% of acid. The temperature of the 160 lbs. crushed was 69°, and the maximum reached was 92°, on the third day. The wine was dry on the fourth day, when it was drawn off.

At three weeks the wine was clear and dry, and at one month was racked and taken to the cellar. At three months the wine was bright, with good aroma and flavor, high acid and astringency. The wine remained in good condition, and at six months was racked for the second time. At eight months it was bright and a very good wine. Tastings at ten and fourteen months showed that it remained in good condition. At eighteen months it tasted mature and was bottled.

No. 1785. *Refosco*, from Mission San José. Received October 21, 1892, in poor condition. The must showed 23.5% of solid contents by spindle and 0.57% of acid. The grapes were fermented with No. 1786, Marzemino, in the proportion of Refosco 47 lbs. and Marzemino 14.5 lbs. The temperature of the grapes at crushing was 64°, and the maximum reached was 81°, on the fourth day. The wine was drawn off on the fifth day.

At one month the wine was clear and was racked and taken to the cellar. At three months it was bright, with good bouquet and flavor, medium acid, and full astringency—a clean-tasting and generally successful blend. At five months it was racked for the third time, and at seven months it had developed well and was an excellent, clean-tasting wine, considering the smallness of the sample. At thirteen months it was still good and mature, but a little *eventé*. A month later it was bottled.

No. 1884. *Refosco*, from Paso Robles station. Received September 21, 1893, in good condition. The bunches were of medium size, very loose, but not coulured; the berries were also of medium size, with rather soft, juicy flesh, sweet, mature, but without much flavor. The must showed 21.9% of solid contents by spindle and 0.58% of acid. There were 130 lbs. of grapes crushed. The temperature at crushing was 68°, and the maximum reached was 87°, on the third day. The wine was nearly dry on the fourth day, and was drawn off on the fifth.

At three weeks the wine was nearly clear, but had a slightly moldy taste; it was racked and taken to the cellar. At four months it was bright, with some bouquet and flavor, high acid and tannin—a fresh-tasting and agreeable but rough wine. It was racked for the second time at four months, and at eight months it was a good wine, but tasted a little green. At eleven months it had improved, and had developed some bouquet, but was not mature. An examination of the lees showed *S. pastorianus*. At seventeen months the wine was in good order—a good, sound wine, with some flavor

and bouquet, good color; its chief faults were a slight greenness and a faint after-taste of mold. A month later it was racked, and a part put in bottle.

No. 1930. *Refosco*, from Tulare station. Received October 13, 1893, in good condition. The bunches were large, loose, winged; the berries of medium size, very ripe, sweet, and with little acid. The temperature of the 362 lbs. crushed was 67°, and the maximum reached was 96°, on the third day. On the fourth day the wine was dry, and was drawn off on the fifth. The must at crushing showed 22.85% of solid contents by spindle and 0.41% of acid.

At one month the wine was clear, very astringent, of good flavor, and had still a slight sweetness. At this time it was racked and taken to the cellar. At four months it was bright, dry, with some bouquet, good flavor, high astringency, and clean taste. It was racked again at five months, and at seven months it retained its good qualities and was, perhaps, the best of the Tulare wines. At ten months the lees showed a few filaments, but the wine was quite bright and tasted perfectly sound; it was smooth and agreeable, with some bouquet and fair color. It was racked, and continued to improve. At sixteen months it was a full and agreeable wine, not quite mature. Two months later it was racked, and part of it put in bottle.

No. 1949. *Refosco*, from Mission San José. A sample for must analysis was received October 14, 1893, in poor condition. The must showed 23.7% of solid contents by spindle and 0.63% of acid.

No. 2053. *Refosco*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were of medium size, conical, well filled; the berries oval, fleshy, very sweet, commencing to dry, tasted a little cooked.

No. 2107. *Refosco*, from Cupertino. A sample for must analysis was received November 5, 1893, in good condition. The bunches were small, conico-cylindrical, sometimes branched, well filled, but not compact; the berries were of under-medium size, slightly elongated, crisp, with thin skin, and mature. The must showed 25.9% of solid contents by spindle and 0.42% of acid.

No. 2117. *Refosco*, from Cupertino. A sample for must analysis was received November 5, 1893, in good condition. The bunches were small, conical, slightly shouldered, well filled, not compact, on long, woody, colored peduncles; the berries were small, nearly round, on slender pedicels. This variety was very ripe and commencing to dry up; it is very distinct from No. 2107.

MARZEMINO.

(See Vit. Rept. 1887-89, p. 164.)

This variety has proved one of the poorest bearers among the Italian varieties. It is a good grower and does not suffer from coulure, but it has failed to bear at any of the stations where it has been tested. It attains a lower percentage of both sugar and acid than most of its congeners, averaging at Cupertino 22.7% of sugar and 0.67% of acid, and at Mission San José 22.77% of sugar and 0.63% of acid. It gives a wine of good color and very high tannin, but not possessed of high enough quality to offset its failure to bear. At Fresno the must has averaged 24.76% of sugar and 0.40% of acid.

ANALYSES OF MUSTS AND WINES.

MARZEMINO.	Date of Picking.	MUST.				WINE.	
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Tannin.	Total Acid as Tartaric at Pressing.
1890—No. 1231. Fresno	Aug. 23	23.41	23.61	.38	.33	.....	.....
No. 1293. Cupertino	Oct. 1	21.10	.....	.89	.28	.....	.....
No. 1358. Mission San José	Oct. 12	23.05	.....	.71	.....	.....	.....
1891—No. 1470. Fresno	Aug. 29	26.10	.....	.41	.....	.....	.....
1892—No. 1786. Mission San José	Oct. 18	22.80	.....	.61	.....	.....	.....
1893—No. 1997. Mission San José	Oct. 19	22.60	.....	.71	.....	.413	.69
No. 2119. Cupertino	Nov. 5	21.50	.....	.69	.....	.355	.68
1894—No. 2243. Mission San José	Oct. 5	19.50	.....	.67	.....	.....	.....

COLOR READINGS.

MARZEMINO.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1891—No. 1470. Fresno	69.0 2VR	27.0 4VR	28.6 4VR	34.8 5VR	22.0 R	23.0 R-1R
1893—No. 1997. Mission San José	125.0 VR					
No. 2119. Cupertino	105.0 1VR					

RECORD OF TREATMENT.

No. 1231. *Marzemino*, from Margherita Vineyard, Fresno. A sample for must analysis arrived August 25, 1890, in excellent condition, and mature. The must showed 23.21% of solid contents by spindle and 0.38% of acid.

No. 1293. *Marzemino*, from Cupertino. A sample for must analysis was received October 3, 1890, in very good condition. The must showed 21.1% of solid contents by spindle and 0.89% of acid.

No. 1358. *Marzemino*, from Mission San José. A sample for must analysis arrived October 14, 1890, in fair condition, and mature. The must showed 23.05% of solid contents by spindle and 0.71% of acid.

No. 1470. *Marzemino*, from Margherita Vineyard, Fresno. A sample for must analysis and color test was received August 31, 1891, in good condition. The must showed 26.1% of solid contents by spindle and 0.41% of acid.

No. 1786. *Marzemino*, from Mission San José. A sample for must analysis and color test was received October 21, 1892, in poor condition. The must showed 22.8% of solid contents by spindle and 0.61% of acid.

No. 1997. *Marzemino*, from Mission San José. A sample for must analysis and for color and tannin tests was received October 19, 1893, in good condition, and mature. The bunches were over medium in size, pyramidal to conical, heavily winged or shouldered, well filled, but not compact; the berries were of medium size, round, on very slender pedicels, and had plenty of acid. The must showed 22.6% of solid contents by spindle and 0.71% of acid.

No. 2119. *Marzemino*, from Cupertino. A sample for must analysis and color and tannin tests was received November 5, 1893, in good condition. The bunches were of medium size, long cylindrical, close; the berries of medium size, round, commencing to shrivel, soft, and with thick skin. The must showed 21.5% of solid contents by spindle and 0.69% of acid.

LAGRAIN.

(See Vit. Rept. 1887-89, p. 247.)

This variety makes a heavy-bodied, astringent wine, of good color. At Tulare it has surpassed all other varieties in the matter of color, being superior to the Petit Bouschet, and, though having less than the St. Macaire to start with, it is much more stable and of better tint. This quality of retaining its color, which it has in spite of its somewhat low acid, is invaluable for Tulare; it would make an excellent blend for coloring purposes. The average composition of the must at Tulare has been 25.95% of sugar and 0.42% of acid, and the vine has borne between three and four tons per acre. At the Bay region stations the vine has not borne well, and as a coloring grape is surpassed there by many others which are better bearers.

ANALYSES OF MUSTS AND WINES.

				MUST.				WINE.					
								Alcohol.		Tannin	Total Acid as Tartaric		Body
			Date of Picking	Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	By Weight	By Volume		At Pressing.	At Six Months	
	LAGRAIN.												
1890	No. 1233.	Fresno	Aug. 23	25.40	24.86	.44	.38						
	No. 1411.	Cupertino	Oct. 28	22.60		.51							
	No. 1419.	Mission San Jose	Oct. 29	25.65		.72	.29	12.62	15.60	.313	.84	.55	3.82
1892	No. 1693.	Tulare	Sept. 28	25.65		.39							
	No. 1788.	Mission San Jose	Oct. 18	21.30		.61							
1893	No. 2002.	Tulare	Oct. 22	25.40	24.86	.43	.45	9.92	12.36	.272	.56	.85	3.70
	No. 2120.	Cupertino	Nov. 6	23.10		.68				.419			
	No. 2358.	Mission San Jose	Oct. 6	22.20		.66				.342			
1894	No. 2220.	Tulare	Oct. 15	26.70		.43							

COLOR READINGS.

				At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
	LAGRAIN.								
1890	No. 1419.	Mission San Jose		149.0 VR	74.1 VR	60.6 4VR	49.4 3VR		
1893	No. 2002.	Tulare		96.2 VR	60.6 1VR	60.6 1VR	55.6 1VR	62.0 2VR	63.6 3VR
	No. 2120.	Cupertino		121.0 1VR					

RECORD OF TREATMENT.

No. 1233. *Lagrain*, from Fresno. A sample for must analysis arrived August 25, 1890, in good condition but for a few dried grapes; very sweet. The must showed 25.1% of solid contents by spindle and 0.44% of acid.

No. 1411. *Lagrain*, from Cupertino. A sample for must analysis was received October 30, 1890, in good condition, but a little soft and overripe. The must showed 22.6% of solid contents by spindle and 0.51% of acid.

No. 1419. *Lagrain*, from Mission San José. Received October 30, 1890, in good condition and ripe. The must showed 25.65% of solid contents by spindle and 0.72% of acid. Only a small quantity of grapes was received; they were fermented as a color sample.

No. 1693. *Lagrain*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 25.65% of solid contents by spindle and 0.39% of acid.

No. 1788. *Lagrain*, from Mission San José. A sample for must analysis arrived October 21, 1892, in poor condition. The must showed 21.3% of solid contents by spindle and 0.64% of acid.

No. 2002. *Lagrain*, from Tulare station. Received October 23, 1893, in good condition. The bunches were small, irregular, well filled; the berries of medium size, well colored, very sweet, overripe. The must showed 25.4% of solid contents by spindle and 0.43% of acid. The temperature of the must at crushing was 67°, and the maximum reached was 81°, on the second day. The murk was nearly dry on the fourth day, when it was pressed.

Three weeks after pressing the wine was still a little sweet, but clear. It was racked and taken to the cellar. At three months it was bright, full-bodied, clean-tasting, with medium acid and astringency, very promising, but only three gallons in quantity. Three months later it was still bright and had developed some bouquet, but it also acquired some volatile acid. After this it deteriorated, on account of the smallness of the keg.

No. 2126. *Lagrain*, from Cupertino. A sample for must analysis arrived November 7, 1893, in good condition, but commencing to dry up. The bunches were of medium size, conical, winged, loose; the berries small, round, and soft. The must showed 24.1% of solid contents by spindle and 0.68% of acid.

GROS MANSENC.

(See Vit. Rept. 1887–89, p. 66.)

This variety has sometimes, on account of the many qualities they have in common, been confounded with the Tannat, from which, however, it is perfectly distinct. The Mansenc, like the Tannat, is a vigorous grower, a fair to good bearer with long-pruning, and produces a must (where the grapes ripen properly) rich in sugar and acid. At Mission San José the grapes seldom ripen thoroughly, but at Cupertino and in parts of Napa and Sonoma they do better. At Cupertino the average composition of the must has been 24% of sugar and 0.77% of acid; at Mission San José, 22% of sugar and 1.20% of acid; at Tulare and Fresno, 25% of sugar and 0.67% of acid; at the Amador station, 24% of sugar and 1.12% of acid.

The wine is easily fermented and a robust keeper; in its roughness and high acidity it resembles the North Italian varieties. It has very intense color, and where the grapes ripen properly it should be very useful as a blending wine. It is not so astringent as the Tannat, but has more color and acidity, and develops more quickly.

Analyses of Musts and Wines.

GROS MANSENC.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body
1890—No. 1243. Fresno	Aug. 26	23.25	22.05	1.15	.40	9.27	11.55	.180	.75	.59	2.95
No. 1277. Cupertino	Oct. 1	23.25	.....	1.20	.31	9.34	11.64	.313	.85	.57	2.82
No. 1339. Mission San José	Oct. 12	23.30	.....	1.25	.17	9.20	11.45	.210	1.09	.62	2.82
1891—No. 1468. Fresno	Aug. 29	24.35	.....	.88	.....	9.70	12.09	.200	.75	.55	3.05
No. 1547. Paso Robles	Oct. 6	21.97	21.00	.81	.....	.....	.....	.....	.....	.....	.....
No. 1562. Mission San José	Oct. 6	20.70	19.54	1.62	.....	7.99	10.00	.275	1.32	.95	3.20
1892—No. 1680. Tulare	Sept. 18	24.35	.....	.36	.....	.....	.....	.....	.....	.....	.....
No. 1763. Paso Robles	Oct. 11	23.70	.....	.61	.....	.....	.....	.....	.....	.....	.....
No. 1766. Mission San José	Oct. 12	20.20	19.20	1.39	.....	7.78	9.73	.242	1.15	1.11	3.20
1893—No. 1833. Amador station	Sept. 8	23.50	.....	1.31	.23	.....	.....	.393	.91	.....	.....
No. 1899. Tulare	Sept. 29	26.10	25.76	.47	.49	9.92	12.36	.294	.50	.51	3.60
No. 2083. Paso Robles	Nov. 4	23.70	22.67	.68	.29	9.20	11.45	.240	.65	.54	2.85
1894—No. 2198. Amador station	Sept. 23	24.20	.....	.93	.....	.....	.....	.....	.....	.....	.....
No. 2204. Tulare	Sept. 25	26.70	.....	.47	.....	.....	.....	.....	.....	.....	.....
No. 2344. Mission San José	Oct. 22	22.60	.....	.88	.....	.....	.....	.....	.....	.....	.....

Color Readings.

GROS MANSENC.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1891—No. 1468. Fresno	43.0 3VR	27.2 3VR	20.5 3VR	21.6 3VR	22.2 3VR	23.0 4VR
No. 1562. Mission San José	154.0 1VR	120.0 2VR	108.0 3VR	61.0 3VR	85.0 2-3VR	....
1892—No. 1766. Mission San José	166.0 2VR	190.0 2VR	125.0 3VR	108.0 2VR	93.0 2VR	88.8 2VR
1893—No. 1833. Amador station	83.0 VR	83.0 VR	....	....	....	....
No. 1899. Tulare	75.5 VR	24.4 2VR	26.3 2VR	24.4 3VR	24.1 5VR	20.0 5VR
No. 2083. Paso Robles	53.5 1-2VR	41.2 1-2VR	32.5 3VR	26.0 3-4VR	19.2 4VR	....

RECORD OF TREATMENT.

No. 1243. *Gros Mansenc*, from Margherita Vineyard, Fresno. Received August 26, 1890, in good condition, but very irregular in the degree of ripeness of the bunches. The must showed 23.25% of solid contents by spindle. The temperature of the grapes at crushing was 66°, and the maximum attained was 86°, on the third day. The murk was dry on the fifth day, when it was drawn off.

The wine was long in clearing, and fermented gently for over two months after it was drawn off. At nine weeks it was clear, had a fairly agreeable, but not marked, flavor, full acid and tannin, and good but not very deep color. At four months it was bright and had been racked twice; the lees showed a good deal of lactic germs; this was also slightly perceptible to the taste; on this account the wine was pasteurized. The wine was racked twice more during the year, and gradually improved and became bright, developed a little bouquet, and lost its slight touch of lactic taint. At fourteen months it was bright, vinous, well flavored, possessed of a little bouquet, and, though highly astringent, was almost mature. At eighteen months it was bottled. Two years after bottling the wine was bright and in first-class order, smooth, clean-tasting, of good body and flavor, though neutral; it had become much smoother and had acquired some delicacy in aging.

No. 1277. *Gros Mansenc*, from J. T. Doyle, Cupertino. Received October 2, 1890, in fair condition. The bunches were small and loose, the berries small; the grapes were not mature and still wet with the rain. The must showed 23.25% of solid contents by spindle. The temperature of the must at crushing was 66°, and the highest temperature reached was 89°, on the fourth day. The murk was drawn off on the sixth day.

The wine was rather slow in clearing, but in two months it was bright, of good flavor and aroma, clean taste, good body and alcohol, and high acid and astringency. At four months the wine had been racked twice, and was bright, with good bouquet and, though the lees showed a few lactic ferments, the taste was unaffected. A week later it was pasteurized for safety. Three months after pasteurizing the wine was bright, perfectly sound, and, though still rough, maturing well. At fifteen months it was nearly mature and of very good quality. Some of the wine was bottled at eighteen months and some of it at twenty-six. At three years the wine was tasted, and that first bottled was found to be sound, but not clear, and was raw-tasting; the second bottled was clearer, of good bouquet and flavor, smooth and agreeable, its general quality very good.

No. 1339. *Gros Mansenc*, from Mission San José. Received October 14, 1890, in good condition, but not quite ripe. The must showed 23.3% of solid contents by spindle. The temperature of the grapes at crushing was 66°, and the maximum temperature reached was 94°, on the fourth day. At the end of the fourth day the murk was nearly dry, and was drawn off.

Three weeks after pressing the wine was clear. At six weeks after pressing it showed good bouquet, pleasing flavor, full astringency, very high acid, its general character rough, but promising. At four months it had been racked twice, and was bright, with strong and pleasing bouquet, full flavor, generally improved and smoother, but with extremely high acid. An examination of the lees at five months showed large quantities of *S. pastorianus*. The wine remained bright and sound, and continued to improve up to the age of seventeen months, when some of it was bottled; the rest was bottled at twenty-two months. At three years and three months—twenty-two and seventeen months after bottling, respectively—both samples were tasted. They were both in good order, with high bouquet and full flavor, rather high acid, but clean-tasting and of excellent quality; the second bottling was the smoother.

No. 1468. *Gros Mansenc*, from Margherita Vineyard, Fresno. Received August 31, 1891, in good condition. The must showed 24.35% of solid contents by spindle. The temperature of the must at starting was 68°, and the highest temperature reached was 84°, on the fourth day. It was somewhat slow in fermenting through, and was pressed on the seventh day while still a little sweet.

Two weeks after pressing the wine was nearly clear and quite dry. It was very rough and highly acid, but improved quickly and soon developed some bouquet. At four months it was racked for the second time; it was bright, with good bouquet and flavor, full acid, rough, but clean-tasting. At six months it had toned down considerably, and was nearing maturity. At nine months it was bright, and, though somewhat lacking in freshness, a good wine. It retained its good qualities, but did not improve much up to seventeen months, when it was bottled. At three years and a half the wine was bright, well flavored, with a little bouquet, of good color and clean taste, and had made no deposit in bottle. Some bottled at twelve months was sound, but not clear, and had made a heavy deposit.

No. 1547. *Gros Mansenc*, from Paso Robles station. A sample for must analysis was received October 8, 1891, in good condition. The grapes were mature, small, in medium-sized bunches. The must showed 21.97% of solid contents by spindle.

No. 1562. *Gros Mansenc*, from Mission San José. Received October 9, 1891, in good condition. The must showed 20.7% of solid contents by spindle. The temperature of the must at starting was 60°, and the highest temperature reached was 90°, on the fourth day. The murk was nearly dry on the fifth day, when it was drawn off.

A month after pressing the wine was clear, possessed of good bouquet and flavor and

excessively high acid. At four months an examination of the lees showed much *S. pastorianus*. At five months it was bright, with rich, vinous bouquet and flavor, adequate astringency, but too much acid. It was racked three times during the first ten months, a portion bottled, and at sixteen months was much toned down and nearly mature. At eighteen months part of it was bottled and the remainder racked. At twenty-two months the wine that remained in wood was in excellent condition and of good quality; its only fault was its somewhat excessive acidity. It made an excellent wine for dilution. It was mature and was bottled. At three years and a half the wine bottled at ten months was bright, of good color, high bouquet, good flavor, medium astringency, and extremely high acid—a very good wine, but much too acid to be used alone. The wine bottled at eighteen months and at twenty-two months differed little from the other, but was not quite so full flavored and was clean-tasting.

No. 1680. *Gros Mansenc*, from Tulare station. A sample for must analysis was received September 21, 1892, in good condition. The must showed 24.35 % of solid contents by spindle.

No. 1763. *Gros Mansenc*, from Paso Robles station. Received October 14, 1892, in good condition. The must showed 23.7 % of solid contents by spindle. The grapes were fermented with No. 1761, Tannat, from Paso Robles.

No. 1766. *Gros Mansenc*, from Mission San José. Received October 15, 1892. The must showed 20.2 % of solid contents by spindle. The temperature of the must at crushing was 58°, and the highest temperature reached was 85°, on the fifth day. The murk was dry on the sixth day, and was drawn off.

Three weeks after pressing the wine was clear, very rough, and extremely acid. At three months it was bright, of good body, harsh, and with a moldy taste, due to the bad condition of the grapes when crushed. The wine was racked four times, and improved a little, but never quite lost its moldy taste and retained its harsh acidity. It was bottled at eighteen months.

No. 1833. *Gros Mansenc*, from Amador station. A sample for must analysis was received September 11, 1893, in good condition. The grapes were very small and not quite mature. The must showed 23.5 % of solid contents by spindle.

No. 1899. *Gros Mansenc*, from Tulare station. Received September 30, 1893. The grapes arrived in good condition and well matured, but with little flavor. The bunches were small, from loose to compact, the berries of medium size, with rather thick skin and little color. The must showed 26.1 % of solid contents by spindle. The temperature of the must at crushing was 66°, and the maximum reached was 82°, on the third day. The murk was dry on the fifth day, and was drawn off.

At one month the wine was nearly clear, smooth, and pleasing, but not perfectly dry. At four months it was clear, of good color, acid, and astringency, but not perfectly clean-tasting. The quantity was rather too small for a fair test. At seven months the wine was sound and in good order, but a little flat.

No. 2083. *Gros Mansenc*, from Paso Robles station. Received November 6, 1893, in fair condition, a few of the grapes moldy. The bunches were of medium size, compact, conical, shouldered; the berries small, juicy, with high acid, and not quite mature. The must showed 23.7 % of solid contents by spindle. The temperature of the must at crushing was 62°, and the maximum reached was 83°, on the fourth day. The murk was nearly dry on the fifth day, and was pressed.

In one month from crushing the wine was clear. At three months it was racked for the second time; it was bright, with good bouquet and rich flavor, clean taste, medium astringency, full, pleasant acid, and in general a light, fresh wine of good quality. At six months it had developed well and was a wine of distinctive character and good quality.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF NORTH ITALIAN TYPE—RED.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
	Nebbiolo.										
1285	Cupertino	1890	22.80		.82	.22					
1364	Cupertino	1890	23.70		.96						
2039	Cupertino	1893	23.70		1.26			.387			
2058	Cupertino	1893	23.30		1.14			.352			
1695	Tulare	1892	22.80		.80						
1700	Tulare	1892	25.40		.41						
1857	Amador station	1893	20.60		1.15						
1858	Amador station	1893	20.20		1.07						
1938	Paso Robles	1893	25.90	24.97	.53	.34		.281			
2277	Asti, Sonoma County	1894	22.20	21.38	.99	.31					
1575	Asti, Sonoma County	1891	26.90	27.65	.45	.26					
	Average, Cupertino		**23.25**		**.89**			**.369**			
	Average, Tulare		**24.10**		**.62**						
	Average, Amador station		**20.40**		**1.11**						
	Barbera.										
1324	Cupertino	1890	27.65		.50						
2040	Cupertino	1893	25.90		1.32			.441			
1445	Tulare	1891	25.65		.77						
1675	Tulare	1892	24.55	25.76	.65	.71	12.18	.124		.56	3.20
1931	Tulare	1893	23.50	21.22	1.03	.41					
2211	Tulare	1894	24.80	23.61	.60		12.50	.204	.65	.52	3.10
1573	Asti, Sonoma County	1891	28.80	28.52	.75	.40	14.20	.265	.85	.52	3.25
2276	Asti, Sonoma County	1894	25.30	24.12	.79						
	Average, Tulare		**25.00**	**24.68**	**.67**	**.71**	**12.34**	**.164**	**.65**	**.54**	**3.15**
	Average, Asti, Sonoma County		**27.05**	**26.32**	**.77**	**.40**	**14.20**	**.265**	**.85**	**.52**	**3.25**

SUMMARY OF ANALYSES OF MUSTS AND WINES OF NORTH ITALIAN TYPE—RED—Continued.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol by Volume	Tannin	Total Acid as Tartaric. At Pressing	At 6 to 8 Months	Body
	Bonarda.										
1362	Cupertino	1890	22.82		.72	.22	11.73	.400	.71	.32	2.70
1384	Cupertino	1890	25.20		1.02	.90	12.36	.286		.60	2.58
1385	Cupertino	1890	24.45		1.09						
1599	Cupertino	1891	24.80		.91	.33	12.36	.356	.83	.83	3.35
2108	Cupertino	1893	25.00		.68			.496			
2110	Cupertino	1893	24.80		.78			.253			
1869	Paso Robles	1893	22.80	19.89	.45	.41	10.08	.134	.40	.57	2.80
2310	Tulare	1894	26.50		.39						
	Average, Cupertino		**24.52**		**.82**	**.48**	**12.15**	**.358**	**.77**	**.58**	**2.88**
	Fresa.										
1327	Cupertino	1890	23.90		.91	.21	12.18	.451	.97	.53	3.08
1600	Cupertino	1891	25.20	24.64	.77	.45	12.46	.440		.70	3.05
2130	Cupertino	1893	25.20		.88			.265			
1469	Fresno	1891	28.20	28.33	.50	.50	14.00		.80	.50	3.82
1553	Paso Robles	1891	25.90		.43						
1613	Paso Robles	1892	24.14		.76						
1913	Paso Robles	1893	24.80	23.61	.66	.68	12.00	.285	.70	.43	2.80
1703	Tulare	1892	24.35		.41						
1976	Tulare	1893	27.35		.38	.31					
2318	Tulare	1894	24.80		.41						
1830	Amador station	1893	20.40		.89	.22		.461			
2175	Amador station	1894	23.70		.68						
	Average, Cupertino		**24.77**	**24.64**	**.86**	**.33**	**12.32**	**.385**	**.97**	**.62**	**3.07**
	Average, Paso Robles		**24.95**	**23.61**	**.62**	**.68**	**12.00**	**.285**	**.70**	**.43**	**2.80**
	Average, Tulare		**23.50**		**.40**	**.31**					
	Average, Amador station		**22.05**		**.78**	**.22**		**.461**			

	Croetto.										
2136	Cupertino	1893	24.70		.68						
	Moretto.										
1633	Tulare	1892	24.01		.62						
1889	Tulare	1893	22.40	21.22	.38	.59		.224			
1906	Tulare	1893	23.25	20.24	.75	.32					
2319	Tulare	1894	26.30		.53						
1852	Amador station	1893	19.70		.77			.208			
2177	Amador station	1894	24.70		.56						
1926	Paso Robles	1893	24.60	23.32	.43	.35		.214			
2215	Paso Robles	1894	22.80		.68						
	Average, Tulare		**23.74**	**20.73**	**.57**	**.46**		**.224**			
	Average, Amador station		**22.20**		**.66**			**.208**			
	Average, Paso Robles		**23.70**	**23.32**	**.55**	**.35**		**.214**			
	Favorita.										
2123	Cupertino	1893	24.80		1.04						
	Tadone.										
2106	Cupertino	1893	23.10		.94						
	Refosco.										
1287	Cupertino	1890	23.90		.55	.27					
1318	Cupertino	1890	25.20		.62	.34	13.27	.244	.66	.42	2.78
1390	Cupertino	1890	24.12		.55						
1416	Cupertino	1890	29.50		1.06	.28					
2053	Cupertino	1893	26.50		.43			.323			
2107	Cupertino	1893	25.90		.42			.425			
2117	Cupertino	1893	26.30		1.07						
1316	Mission San José	1890	27.55		.71						
1343	Mission San José	1890	26.50		.63	.22					
1516	Mission San José	1891	24.45	24.53	.74		12.09	.220	.75	.35	3.04
1707	Mission San José	1892	22.80	22.05	.67	.29	11.18	.229	.63	.49	2.85
1785	Mission San José	1892	23.50		.57						
1949	Mission San José	1893	23.70		.63			.358			
2268	Mission San José	1894	22.40		.47			.173			
2302	Mission San José	1894	23.10		.43						
1584	Mission San José	1891	24.45	22.67	.50		12.00	.220	.48	.70	3.45
1496	Paso Robles	1891	19.30	18.30	.47	.31	9.73	.170	.46	.30	2.80
1650	Paso Robles	1892	21.75		.75						
1884	Paso Robles	1893	21.90	19.89	.58	.28	9.90	.266	.60	.58	2.85
1526	Asti, Sonoma County	1891	25.30	24.12	.39	.33	12.77	.294	.55	.41	2.95
1615	Tulare	1892	21.50	18.58	.48	.30	9.90	.270	.43	.39	3.05
1930	Tulare	1893	22.85	21.47	.41	.49	11.00	.268	.49	.42	2.66

SUMMARY OF ANALYSES OF MUSTS AND WINES OF NORTH ITALIAN TYPE—RED—Continued.

Number	LOCALITY.	Vintage of	MUST.				WINE.				
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Tannin	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At 6 to 8 Months.	Body
	Refosco—Continued.										
2171	Tulare	1894	24.00	23.42	.41		11.36	.291	.40	.51	3.10
	Average, Cupertino		**25.12**		**.51**	**.30**	**13.27**	**.244**	**.66**	**.42**	**2.78**
	Average, Mission San Jose		**24.27**	**23.08**	**.58**	**.26**	**11.76**	**.240**	**.62**	**.51**	**3.11**
	Average, Paso Robles		**20.98**	**19.09**	**.60**	**.29**	**9.81**	**.218**	**.53**	**.44**	**2.83**
	Average, Tulare		**22.78**	**21.16**	**.47**	**.39**	**10.75**	**.276**	**.44**	**.44**	**2.93**
	Neiretta.										
2135	Cupertino	1893	22.40		.68						
	Marzemino.										
1231	Fresno	1890	23.41	23.61	.38	.33					
1470	Fresno	1891	26.10		.41						
1293	Cupertino	1890	21.10		.89	.28					
2119	Cupertino	1893	21.50		.69			.355	.68		
1358	Mission San José	1890	23.05		.71						
1786	Mission San José	1892	22.80		.61						
1997	Mission San José	1893	22.60		.71			.413	.69		
2243	Mission San José	1894	19.50		.67						
	Average, Fresno		**24.75**	**23.61**	**.39**						
	Average, Cupertino		**21.30**		**.79**			**.355**	**.68**		
	Average, Mission San Jose		**21.99**		**.67**			**.413**	**.69**		
	Lagrain.										
1233	Fresno	1890	25.10	24.86	.44	.38					
1411	Cupertino	1890	22.60		.51						
2126	Cupertino	1893	24.10		.68			.419			
1419	Mission San José	1890	25.65		.72	.20	15.50	.313	.84	.55	3.82
1788	Mission San José	1892	21.30		.64						
2258	Mission San José	1894	22.20		.66			.342			

1693	Tulare	1892	25.65		.39						
2002	Tulare	1893	25.40	24.86	.43	.45	12.36	.272	.55	.85	3.70
2320	Tulare	1894	26.70		.43						
	Average, Cupertino		**23.35**		**.59**			**.419**			
	Average, Mission San Jose		**23.05**		**.67**	**.20**	**15.50**	**.327**	**.84**	**.55**	**3.82**
	Average, Tulare		**25.91**	**24.86**	**.41**	**.45**	**12.36**	**.272**	**.55**	**.85**	**3.70**
	Gros Mansenc.										
1243	Fresno	1890	23.25	22.05	1.15	.40	11.55	.180	.75	.59	2.95
1468	Fresno	1891	24.35		.88		12.09	.200	.75	.55	3.05
1277	Cupertino	1890	23.25		1.20	.31	11.64	.313	.85	.87	2.82
1339	Mission San José	1890	23.30		1.25	.17	11.45	.210	1.09	.62	2.82
1562	Mission San José	1891	20.70	19.54	1.62		10.00	.275	1.32	.95	3.20
1766	Mission San José	1892	20.20	19.20	1.39		9.73	.242	1.15	1.11	3.20
2344	Mission San José	1894	22.60		.88						
1547	Paso Robles	1891	21.97	21.00	.81						
1763	Paso Robles	1892	23.70		.61						
2083	Paso Robles	1893	23.70	22.67	.68	.29	11.45	.240	.65	.54	2.85
1680	Tulare	1892	24.35		.36						
1899	Tulare	1893	26.10	25.76	.47	.49	12.36	.294	.50	.51	3.60
2204	Tulare	1894	26.70		.47						
1833	Amador station	1893	23.50		1.31	.23		.393	.91		
2198	Amador station	1894	24.20		.93						
	Average, Fresno		**23.80**	**22.05**	**1.02**	**.40**	**11.82**	**.190**	**.75**	**.57**	**3.50**
	Average, Mission San Jose										
	Average, Paso Robles		**23.12**	**21.83**	**.70**	**.29**	**11.45**	**.240**	**.65**	**.54**	**2.85**
	Average, Tulare			**25.76**	**.43**	**.49**	**12.36**	**.294**	**.51**	**.50**	**3.60**
	Average, Amador station										

AUSTRIAN AND HUNGARIAN TYPE—RED.

(See Vit. Rept. 1887-89, p. 230.)

Perhaps the most valuable of the red grapes cultivated in Austria are the Refosco and the Marzemino. These varieties, however, together with Lagrain, are so distinctly congeneric with those which make the distinct type of North Italian grapes, that they are included in the same group.

The four grapes here classed together are somewhat diverse in character, and should be denominated simply a group rather than a type. They agree, however, in being smooth, quick maturing, and of ordinary quality. The wide range of adaptability of the Zinfandel is not characteristic of the other three, which are successful only in certain favorable localities. The famous Kadarkas has, so far, been a failure here, but has given indications that, under favorable conditions, it is capable of yielding a good wine. It should be tried further in the lower coast counties.

KADARKAS.

(See Vit. Rept. 1887-89, p. 245.)

The locality in California, suitable to the Kadarkas, if such a one exists, has not yet been found. It will occasionally make a good wine in the Bay region, but is generally lacking in color, often in tannin and sugar, and sometimes in acid. Altogether it is very unreliable for any locality where it has been yet tested. The fine quality of the wine, however, which it sometimes makes in favorable years, and its high reputation in eastern Europe, make further experiments under other conditions desirable. At Fresno the vine has not borne well, and the must seems to be low in acid. At Pomona the Kadarkas has just come into bearing, but it gives indications of being very well adapted to the conditions which exist there.

Analyses of Musts and Wines.

KADARKAS.			MUST.				WINE.					
		Date of Picking	Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At Six Months	Body
1890	No. 1307. Cupertino	Oct. 6	21.30		.72	.27	8.27	10.36	.138	.62	.40	2.58
	No. 1418. Mission San José	Oct. 27	25.85		.58	.28	10.35	12.82	.233	.62	.48	3.58
1891	No. 1461. Fresno	Aug. 29	23.70	23.13	.42							
1892	No. 1787. Mission San José	Oct. 18	23.70		.68							
1893	No. 1986. Mission San José	Oct. 17	22.20	21.80	.68	.20	7.92	9.90	.371	.57	.54	3.10
	No. 2042. Cupertino	Oct. 30	23.20		.57				.440			
1894	No. 2257. Mission San José	Oct. 5	20.85		.47				.349			

Color Readings.

KADARKAS.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1893 No. 1986. Mission San José		20.0 4VR	20.0 4VR	15.8 5VR	5.7 3R(Y)	4.0 (Y)
No. 2042. Cupertino	45.5 1VR					
1894 No. 2257. Mission San José	15.0 1R					

RECORD OF TREATMENT.

No. 1307. *Kadarkas*, from Cupertino. Received October 8, 1890, in good condition—a few grapes cracked by the rain, but none moldy; not quite mature. The must showed 21.3% of solid contents by spindle and 0.72% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 86°, on the fourth day. On the fifth day the wine was dry and was racked off.

The wine was somewhat slow in clearing, but at one month, though still cloudy, promised well and possessed a very pleasant aroma and agreeable acid. At three months it had been racked twice, and was bright; but the lees showed some filaments, and the taste was slightly suspicious, so the wine was pasteurized. Otherwise, it had a light, pleasing bouquet, good flavor, medium acid and astringency; generally of good quality. At seven months it had improved; it was bright, clean-tasting, of delicate bouquet, full flavor—a light but harmonious wine of good quality. It was racked twice after this, and at fifteen months was in first-class condition, with full bouquet and flavor, little color, very fresh, and mature. Two months later part was bottled, and at two years the remainder was bottled. At twenty-seven months both bottlings were smooth and agreeable, with very light color; the second bottled was brighter and cleaner-tasting.

No. 1418. *Kadarkas*, from Mission San José. Received October 30, 1890, in good condition, and mature. The must showed 25.85% of solid contents by spindle and 0.58% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 87°, on the fourth day. The wine was racked off the sixth day, when it was dry.

At one month the wine was clear, with strong, pleasing aroma and flavor, good acid, and medium astringency; full-bodied, smooth, and well developed. The lees early showed a few filaments, but the taste was unaffected, and at three months the wine was bright and well developed. At six months the wine had been racked twice, and was in very good order. At thirteen months it was bright, retained a fair color, showed marked and characteristic bouquet and flavor—an excellent wine but for a slight bitterness of aftertaste; the wine had kept very well, considering the small quantity (two gallons). At fifteen months it was bottled. One year after bottling the wine was smooth and agreeable, but not quite clean-tasting.

No. 1461. *Kadarkas*, from Margherita Vineyard, Fresno. A sample for must analysis was received August 31, 1891, in good condition. The must showed 23.7% of solid contents by spindle and 0.42% of acid.

No. 1787. *Kadarkas*, from Mission San José. A sample for must analysis arrived October 21, 1892, in poor condition. The must showed 23.7% of solid contents by spindle and 0.68% of acid.

No. 1986. *Kadarkas*, from Mission San José. Received October 19, 1893, in good condition. The bunches were of medium size, regular cylindrical, with one wing about one third the length of the bunch, well filled, but not compact; the berries were of medium size, round, juicy, thin-skinned, well colored, and mature. The must showed 22.2% of solid contents by spindle and 0.68% of acid. The temperature of the grapes at crushing was 61°, and the maximum reached was 81°, on the fourth day. On the fifth day the wine was drawn off, dry.

The wine remained cloudy for some time, but at six weeks, when it was racked for the first time, was clear. At three months it was clear, but not bright, had full acid and astringency and clean taste. After this it improved, was at first somewhat green, but at ten months had developed some bouquet, had good flavor, and was altogether a good wine, though lacking in color.

No. 2042. *Kadarkas*, from Cupertino. A sample for must analysis and for color and tannin tests arrived October 31, 1893, in good condition. The bunches were small, cylindrical, sometimes branched, close; the berries were medium to large in size, rather pulpy, but soft, sweet, and well colored. The must showed 23.2% of solid contents by spindle and 0.57% of acid.

GROSSBLAUE.

(See Vit. Rept. 1883-84, p. 92; 1885-86, p. 75; 1887-89, p. 249.)

Synonyms: Kölner; Blauer Kölner.

Description.—Vine vigorous, with slender, reddish-brown canes; leaves small, five-lobed, split to the middle, red-veined, woolly below and on the petiole, lateral sinuses very obtuse at the base, and often with a large tooth; bunches large, pyramidal, and close; berries large, dark-colored, sweet, and agreeable as an eating-grape. Both the berries and the leaves are smaller in California than they are described as being in Europe. The wine, which in Europe is lacking in color, is here remark-

able for both the quality and the intensity of the color. These differences are almost too great to be laid to change of local conditions, and throw some doubt on the identification of the variety.

Later experiments with this variety show that with proper care a good wine can be made from it. The wine always has a beautiful and stable color, good acid and astringency. When the grapes are allowed to attain complete maturity, with 24% to 25% of solid contents, the wine is very smooth and soft, somewhat of Burgundy character, but with more of a Claret color. The chief defects of the grapes are a somewhat neutral character and a tendency to coulure, unless pruned long.

Analyses of Musts and Wines.

	GROSSBLAUE.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At six Months	Body
1890	No. 1381. Mission San José	Oct. 18	25.10	.....	.77	.27	10.07	12.54	.263	.62	.34	3.08
1891	No. 1555. Paso Robles	Oct. 6	26.60	.....	.36	.....	.....	.....	.....	.....	.....	.....
	No. 1604. Mission San José	Oct. 27	24.90	25.19	.54	.....	10.26	12.73	.320	.45	.47	3.35
1892	No. 1682. Tulare	Sept. 19	24.80	.....	.33	.....	.....	.....	.....	.....	.....	.....
	No. 1751. Paso Robles	Oct. 11	22.60	.....	.49	.....	.....	.....	.....	.....	.....	.....
	No. 1768. Mission San José	Oct. 13	20.00	19.08	.83	.....	8.34	10.42	.262	.77	.53	2.30
1893	No. 1829. Amador station	Sept. 7	21.95	.....	.95	.....	.....	.....	.451	.....	.....	.....
	No. 1881. Paso Robles	Sept. 14	21.50	21.22	.76	.30	8.64	10.58	.182	.59	.59	3.20
	No. 1937. Tulare	Oct. 12	25.00	24.64	.49	.43	.....	.....	.417	.....	.....	.....
	No. 2129. Cupertino	Nov. 3	23.70	.....	.82	.....	.....	.....	.249	.....	.....	.....
1894	No. 2253. Mission San José	Oct. 5	22.20	.....	.68	.....	.....	.....	.....	.65	.....	.....
	No. 2285. Amador station	Oct. 6	25.45	.....	.58	.....	.....	.....	.....	.....	.....	.....
	No. 2323. Tulare	Oct. 15	25.00	.....	.46	.....	.....	.....	.....	.....	.....	.....

Color Readings.

	GROSSBLAUE.	At Pressing.		One Month.		Two Months.		Three Months.		Four Months.		Five Months.	
1891	No. 1604. Mission San José	102.6	1VR	95.2	1VR	44.0	2VR	.....	.....	.....	.....	.....	.....
1892	No. 1768. Mission San José	95.2	2VR	83.3	1VR	65.2	1VR	59.7	1VR	60.6	1VR	49.4	1VR
1893	No. 1829. Amador station	115.0	VR	115.0	VR	.....	.....	.....	.....	.....	.....	.....	.....
	No. 1881. Paso Robles	45.5	VR	37.1	1VR	27.5	3VR	23.6	3VR	23.8	3VR	19.4	5VR
	No. 1937. Tulare	36.0	1VR	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	No. 2129. Cupertino	70.2	2VR	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	No. 2253. Mission San José	85.1	VR	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1381. *Grossblaue*, from Mission San José. Received October 20, 1890, in bad condition, crushed and moldy. The must showed 25.1% of solid contents by spindle and 0.77% of acid. The temperature of the must at crushing was 68°, and the maximum reached was 89°, on the second day. On the fourth day the murk was dry, and was drawn off.

At one month the wine was nearly clear, with low acid, good astringency and flavor, but a little taste of mold. At six weeks the lees were sound, and the wine was racked. At three months the lees showed a few filaments, and the wine was pasteurized; it was bright, but had not improved much. At seven months it was in good condition, much improved, moldiness nearly gone, full-bodied, but without much character. It remained in good order for some months after this, but at fifteen months, when it was bottled, it had deteriorated, tasted flat, and lacked bouquet.

No. 1555. *Grossblaue*, from Paso Robles station. Received October 8, 1891, in good condition, and mature. The bunches were small and well filled with grapes over-average in size. No wine was made. The must showed 26.6% of solid contents by spindle and 0.36% of acid.

No. 1604. *Grossblaue*, from Mission San José. Received October 28, 1891, in bad condition. The must showed 24.9% of solid contents by spindle and 0.36% of acid. The temperature of the grapes at crushing was 67°, and the maximum of 86° was reached on the second day. On the third day the murk was nearly dry, and was drawn off.

In one month the wine was clear, but still retained a little sugar. The lees were examined, and proved to be sound. At two months the wine was bright, full-flavored and full-bodied, but a little flat. The lees were examined again at three and at five months, but no bad germs were found. At ten months the wine was racked for the third time. At sixteen months it was in good order, had developed some bouquet, and was generally much improved. Part of it was bottled and the rest racked into a smaller keg. Six months later it had acquired a slight bitterness, but was otherwise a good wine. At twenty-two months the rest was bottled. Two years after bottling the wine was perfectly bright, without deposit—a very smooth, soft wine of Burgundy type, lacking in character, but very agreeable and of beautiful color.

No. 1682. *Grossblaue*, from Tulare station. A sample for must analysis was received September 21, 1892, in good condition. The must showed 24.8% of solid contents by spindle and 0.33% of acid.

No. 1751. *Grossblaue*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 22.6% of solid contents by spindle and 0.49% of acid.

No. 1768. *Grossblaue*, from Mission San José. Received October 15, 1892, in good condition. The must showed 20.0% of solid contents by spindle and 0.83% of acid. The temperature of the must at crushing was 58°, and the maximum reached was 88°, on the fifth day. On the seventh day the murk was drawn off, nearly dry.

A month from pressing the wine was clear, but still had a trace of sugar. It was racked, and two months later was bright, with little bouquet, but good flavor, clean taste, medium acid, astringency, and body. At five months it was in good order and of advanced development. At eight months it had been racked three times, and had developed some bouquet. After this it remained bright, and at fourteen months was a good wine, but lacking somewhat in flavor. At sixteen months it was mature, and was bottled. Eighteen months after bottling the wine was bright, without deposit—a light, somewhat greenish wine, of agreeable flavor and beautiful color.

No. 1829. *Grossblaue*, from Amador station. A sample for must analysis arrived September 8, 1893, in good condition. The bunches were small and somewhat coulured; the berries very unequal in size, well colored. The must showed 21.95% of solid contents by spindle and 0.95% of acid.

No. 1881. *Grossblaue*, from Paso Robles station. Received September 16, 1893, in good condition. The bunches were very varied, some small and loose, some large and more compact; the berries were large, well colored, and mature. The must showed 21.5% of solid contents by spindle and 0.76% of acid. The temperature of the must at crushing was 68°, and the maximum reached was 87°, on the third day. On the fifth day the murk was nearly dry, and was drawn off.

At one month the wine was clear, clean-tasting, and with high acid. After th second racking at four months it was bright, well flavored, but somewhat thin and the acid rather green. It improved after this, and developed some bouquet, but the acid continued somewhat raw. At eleven months the lees were examined, and they showed some *S. pastorianus*. At this time the wine was not mature, but of good quality. At eighteen months the wine was bright, improved, nearly mature, of fair bouquet and flavor. It was bottled a month later. Eleven months after bottling the wine was bright, of medium acid and astringency—a very good wine, but without marked character.

No. 1937. *Grossblaue*, from Tulare station. A sample for must analysis was received October 13, 1893, in good condition. The bunches were small, round, loose; the

berries of good size, soft, and very sweet. The must showed 25.0% of solid contents by spindle and 0.49% of acid.

No. 2129. *Grossblaue*, from Cupertino. A sample for must analysis arrived November 5, 1893, in good condition. The bunches were of good size, conical, branching, and well filled; the berries of medium size, juicy, commencing to dry. The must showed 23.7% of solid contents by spindle and 0.82% of acid.

BLUE PORTUGUESE.

(See Vit. Rept. 1887-89, p. 242.)

The latest results obtained with the Blue Portuguese confirm the opinions expressed in the last report. It is a good grower, bears well, matures early, and preserves its soundness remarkably well; in the northern coast counties it makes a heavy-bodied wine, with good color and astringency, but low acid and consequent poor keeping qualities. The average composition of the must has been: at Mission San José, sugar 24.72% and acid 0.41%; at Cupertino, sugar 25.92% and acid 0.56%. At Tulare the vine is a good grower, shades its grapes well, and bears heavily, even in somewhat strong alkali soil. The defects of its wine, however, are increased there, and it loses most of the intensity of color that distinguishes it in other localities. The average composition of the musts analyzed at the station has been 22.5% of sugar and 0.40% of acid; but this includes some of imperfectly ripe grapes; the average acid content of ripe grapes is little over 0.30%. The wine is thus difficult to ferment, is flat-tasting, and of poor keeping qualities. It cannot, therefore, be recommended for Tulare County, in spite of its steady and abundant crops, for its lowness in acid is a fatal defect. The grapes may doubtless be advantageously used for blending with grapes of high acid, and tannin, and without detriment to their quality.

BLUE PORTUGUESE.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body	WINE. Sugar
1890—No. 1206. Fresno	Aug. 12	24.25	23.81	.38	.63	16.22	19.96*	.160	.48	.41	3.08*	2.02
No. 1262. Mission San José	Sept. 24	24.35	.....	.45	.33	9.63	12.00	.217	.48	.50	2.58	.....
No. 1365. Cupertino	Oct. 14	26.10	.....	.39	.....	.....	.....	.....	.....	.....	.....	.....
No. 1399. Cupertino	Oct. 18	27.60	.....	.50	.....	.....	.....	.....	.....	.....	.....	.....
1891—No. 1440. Tulare	Aug. 24	24.38	.....	.30	.....	.....	.....	.....	.....	.....	.....	.....
No. 1511. Mission San José	Sept. 24	24.35	.....	.39	.....	9.92	12.36	.327	.46	.42	3.35	.....
1892—No. 1618. Tulare	Aug. 28	24.35	22.20	.35	.50	9.20	11.45	.127	.32	.50	3.58	.....
No. 1683. Mission San José	Sept. 24	22.15	.....	.55	.....	8.84	11.00	.252	.48	.50	2.12	.....
1893—No. 1813. Tulare	Aug. 30	19.30	18.89	.57	.44	7.43	9 27	.202	.47	.41	2.95	.....
No. 1815. Tulare	Sept. 2	20.04	20.00	.50	.48	7.78	9.73	.134	.47	.47	3.00	.....
No. 1985. Mission San José	Oct. 17	27.40	27.25	.45	.....	11.62	14.20	.400	.51	.47	3.30	.....
No. 2038. Cupertino	Oct. 29	23.50	.....	1.05	.....	.....	.....	.451	.....	.....	.....	.....
No. 2113. Cupertino	Nov. 3	24.40	.....	.56	.....	.....	.....	.321	.....	.....	.....	.....
1894—No. 2137. Tulare	Sept. 3	24.45	24.22	.29	.42	9.85	11.50	.229	.43	.57	4.35	.....
No. 2256. Mission San José	Oct. 5	23.70	.....	.40	.....	.....	.....	.....	.38	.....	.....	.....

*Fortified.

COLOR READINGS.

BLUE PORTUGUESE.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.	Six Months.
1891—No. 1511. Mission San José	95 2 1VR	71.4 1VR	55.5 2VR	55.5 2VR	44.9 3VR	37.0 5VR	.....
1892—No. 1618. Tulare	16.6 R	16.0 1VR+Y	15.6 1VR+Y	14.2 1VR+Y	12.9 1VR+Y	12.9 1VR+Y	12.5 1VR+Y
No. 1683. Mission San José	142.0 VR	54.1 1VR	43.5 1VR	42.1 1VR	41.6 1VR	40.0 1VR	.....
1893—No. 1813. Tulare	21.1 3VR	9.3 2R	9.2 3R	9.5 3R	8.3 (Y)	8.3 (Y)	.....
No. 1815. Tulare	18.8 4VR	11.2 5VR	7.6 4R	8.5 4R	.....	.....	.....
No. 1985. Mission San José	100.0 VR	62.5 1VR	57.1 1VR	57.1 1–2VR	42.5 2VR	32.0 3VR	.....
No. 2038. Cupertino	129.0 1VR	.....	.....	.....	.....	.....	.....
No. 2113. Cupertino	83.3 VR	.....	.....	.....	.....	.....	.....
1894—No. 2137. Tulare	27.0 2VR	25.5 4VR	23.9 5VR	16.5 R	.....	.....	.....
No. 2256. Mission San José	72.8 1VR	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1206. *Blue Portuguese*, from Fresno. Received August 14, 1890, in fair condition, and quite mature. The must showed 24.25% of solid contents by spindle and 0.38% of acid. The temperature of the must at crushing was 69°, and the maximum reached was 77°, on the fourth day. On the fifth day the fermentation was very slow, and the must showed 7.5% of solid contents by spindle; it was drawn off and fortified.

At four months the wine was bright, but harsh, unpleasing, and somewhat bitter. At this date it was racked and put into the hot-box, where it was kept at a temperature of 110° for three months. At two months after heating it was bright, dark-colored, of good bouquet, much improved in flavor, but still a little bitter. It was racked again, and at seventeen months after crushing was in good order, a fairly agreeable wine, but too acid and with very little Port character. At two years and a half it was smooth and clean-tasting, with some flavor, but too much acid. Four months later it had deteriorated.

No. 1262. *Blue Portuguese*, from Mission San José. Received September 26, 1890, in fair condition, and mature. The must showed 24.35% of solid contents by spindle and 0.45% of acid. The temperature of the must was 67° at starting, and 87° was the maximum, reached on the fourth day. On the fifth day the murk was nearly dry, and was drawn off.

The wine was slow in clearing and soon developed filaments in the lees. At two months it was clear, of low acid and good astringency, dark-colored, coarse and rough. At three months the wine was pasteurized; it was clear, but the taste was suspicious, and the lees showed a good many filiform germs. At seven months it was bright, with very little taste, due to improper fermentation; it had improved generally, and was a smooth, agreeable wine, but a little flat. After this it remained clear, but deteriorated in quality, and became tasteless and flat. It was racked twice, and at sixteen months put in bottle. Two years after bottling it was tasted and found to have changed very little; it had kept its color well, but was insipid.

No. 1365. *Blue Portuguese*, from Cupertino. A sample for must analysis was received October 17, 1890, in fair condition, a little dried and past maturity. The must showed 26.1% of solid contents by spindle and 0.39% of acid.

No. 1399. *Blue Portuguese*, from Cupertino. A sample for must analysis arrived October 21, 1890, in poor condition—shriveled, moldy, and overripe. The must showed 27.0% of solid contents by spindle and 0.50% of acid.

No. 1440. *Blue Portuguese*, from Tulare station. A sample for must analysis arrived August 27, 1891, in good condition. The must showed 24.38% of solid contents by spindle and 0.30% of acid.

No. 1511. *Blue Portuguese*, from Mission San José. Received September 27, 1891, in rather moldy and crushed condition. The must showed 24.35% of solid contents by spindle and 0.39% of acid. The temperature of the grapes at crushing was 67°, and the maximum of 91° was reached on the third day. The wine was nearly dry on the fourth day, when it was drawn off.

In one month the wine was quite clear and dry, very rough, and smelled a little moldy. A little later the lees showed a few filaments, and in a month the taste was beginning to be affected, so the wine was pasteurized. Four months after pasteurizing it had improved, was bright, very heavy-bodied, still coarse and flat. After this the wine was racked twice, and improved a little; at sixteen months it was a fair wine, and the unsound fermentation was quite arrested; it tasted a little flat, however. A few days later it was put in bottle.

No 1618. *Blue Portuguese*, from Tulare station. Received September 1, 1892, in good condition. The must showed 24.35% of solid contents by spindle and 0.35% of acid. The temperature of the grapes at crushing was 68°, and the maximum, reached on the third day, was 93°. The wine was dry on the fifth day, when it was drawn off.

The wine was slow in clearing, and fermented for some time after pressing. At six weeks it was dry, and was pasteurized, as it tasted a little suspicious. At four months it was clear, but very inferior. At six months it was bright and improved, and would have been a fair wine but for a slight bitterness. From six to eleven months it was at its best, and changed very little. After that it deteriorated. At sixteen months it was bottled.

No. 1683. *Blue Portuguese*, from Mission San José. Received September 27, 1892, in good condition. The must showed 22.15% of solid contents by spindle and 0.55% of acid. The temperature of the grapes at crushing was 67°, and the maximum, reached on the third day, was 93°. The wine was dry on the fourth day, when it was racked off.

At three weeks, when it was racked and taken to the cellar, it was clear, but not very clean-tasting. At three months it was bright, with full bouquet and flavor, medium acid, good astringency—an agreeable wine, but lacking in after-taste. After this it remained in good order, and improved but never became quite clean-tasting. At eleven months it showed good quality, but had a disagreeable odor. It soon matured, and at eighteen months was bottled.

No. 1813. *Blue Portuguese*, from Tulare station. Received September 1, 1893, in fair condition, a little moldy. The bunches were of good size and without coulure; the berries of good size, thin-skinned, and with little flavor. The must showed 19.3% of solid contents by spindle and 0.57% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached, on the sixth day, was 91°. On the seventh day the wine was drawn off, dry.

At one month the wine was clear, and at four months bright, but of poor quality. At ten months it had been racked twice, was clear, but flat, and with a disagreeable odor. It was little better than No. 1815.

No. 1815. *Blue Portuguese*, from Tulare station. Received September 4, 1893, in good condition. The must showed 20.04% of solid contents by spindle and 0.50% of acid. The temperature of the must at crushing was 67°, and the maximum, reached on the third day, was 100°. On the fourth day the wine was dry, and was racked off.

The wine was slow in clearing, and at one month was still cloudy and not clean-tasting. It was racked and taken to the cellar, and at five months, when it was racked for the second time, it was clear, but flat and of poor quality. After this, though it remained clear, it did not improve in quality, and at eleven months it was bright, but flat and poor.

No. 1985. *Blue Portuguese*, from Mission San José. Received October 19, 1893, in good condition, and very ripe. The bunches were rather large to medium, well filled, conico-cylindrical, with large shoulders, on very thick, woody peduncles; the berries were small, nearly round, thin-skinned, fleshy, and soft, very ripe, but very few dried. The must showed 27.4% of solid contents by spindle and 0.45% of acid. The temperature of the must at crushing was 59°, and the maximum, reached on the fifth day, was 85°. On the seventh day the wine was drawn off, though not quite dry.

At six weeks the wine was clear, but bitter. At three months it was bright, of good body, high astringency, medium acid, little bouquet, and some flavor; still a little bitter. At six months it had changed little, but had become a little flat. At nine months it showed some good qualities, but was not quite clean-tasting.

No. 2038. *Blue Portuguese*, from Cupertino. A sample for must analysis arrived October 31, 1893, in good condition. The bunches were over-medium in size, long conical, shouldered, close; the berries of medium size, round, much shriveled, and overripe. The must showed 23.5% of solid contents by spindle and 1.05% of acid.

No. 2113. *Blue Portuguese*, from Cupertino. A sample for must analysis arrived November 5, 1893, in good condition. The bunches were of medium size, long conico-cylindrical, close; the berries pulpy, very sweet, overripe, and commencing to shrivel, but without any raisin taste. The must showed 24.4% of solid contents by spindle and 0.56% of acid.

ZINFANDEL.

(See Vit. Rept. 1883–85, p. 96; 1885–86, p. 80; 1887–89, p. 230.)

Description.—Vine a vigorous grower, with grayish-brown wood; leaf dark green, lobed, with lighter green below, rather hairy or woolly, long; leaf-stem reddish, also long and wavy, young shoots slightly tomentose, tinged with red; bunches long and heavy, shouldered, often double or the shoulder as long as the main bunch, stem short and strong, brown, compact; berry medium, round, black with blue bloom and a peculiar star-like dot in the center, but often intermingled with small shriveled berries, ripening unevenly, very juicy, with a lively acid mingling with the sweet; skin thin. The vine is very productive, easy of cultivation, often producing a second and even a third crop from the laterals. Well adapted to short stool-pruning, and 3 to 4 feet stakes. (Prof. George Husmann.)

ANALYSES OF MUSTS AND WINES.

ZINFANDEL.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight.	Alcohol. By Volume.	Tannin	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At 6 to 8 Months.	Body	Ash	Sugar
1890—No. 1253. Fresno	Aug. 25	23.70	24.11	.54	.42	9.34	11.64	.199	.58	.45	2.78	.31	.22
No. 1253*a*. Fresno						9.20	11.45	.191	.59	.52	3.32	.55	.24
No. 1253*b*. Fresno						9.27	11.55	.199	.46	.48	3.08	.48	.22
No. 1257. Amador station	Sept. 23	22.60		.55	.29	10.35	12.82	.241	.54	.50	2.82		
1892—No. 1656. Amador station	Sept. 16	23.73		.69									

COLOR READINGS.

ZINFANDEL.	At Pressing.	One Month.	Two Months.	Three Months.	Four Months.	Five Months.
1890—No. 1253. Fresno	26.5 3VR	3.6 1VR+2Y	4.0 2VR+2Y	4.4 2VR+2Y	Too light for instrument.	
No. 1253*a*. Fresno	33.7 3VR	8.6 R	9.6 R	9.7 R	3.6 2VR+2Y	
No. 1253*b*. Fresno	26.2 2VR	11.0 4VR	10.8 R	7.8 2R	3.6 2R+1Y	
No. 1257. Amador station	37.0 4VR	14.7 5VR	12.7 5VR	10.0 R	10.0 R–1R	3.8 3VR+1Y
1892—No. 1656. Amador station	Too	light for instrument.				

RECORD OF TREATMENT.

No. 1257. *Zinfandel*, from Amador station. Received September 26, 1890, in poor condition; the grapes were badly crushed and some of them moldy. The bunches were of average size, compact, and shouldered; the berries small to medium, quite mature. The must showed 22.6 % of solid contents by spindle and 0.55 % of acid. The temperature of the grapes at crushing was 66°, and the maximum reached, on the fourth day, was 77°. The fermentation was very slow, and the wine was still very sweet when it was drawn off on the sixth day.

At two weeks the wine was still very sweet and fermenting. At one month it was turbid, fermenting, and contained about 0.4 % of sugar. At two months it was clear and dry, of fair color, low acid, high astringency, and strong, characteristic flavor. Two weeks later the lees showed some filaments under the microscope, and the wine was pasteurized at 160° F. At three months the lees appeared sound, and at seven months the wine was bright and had improved very much in smoothness. At eight months it was racked for the third time. At fourteen months it was in good order, full-flavored, nearly mature, and had developed some bouquet. At seventeen months it was racked and part put in bottle; six months later the rest was bottled. At three years and three months both samples were in first-class condition, with little bouquet, strong Zinfandel flavor, and clean taste. That bottled at seventeen months was more highly flavored and of deeper color, while that bottled at twenty-three months was smoother.

No. 1656. *Zinfandel*, from Amador station. A sample for must analysis was received September 19, 1892, in poor condition. The must showed 23.7 % of solid contents by spindle and 0.69 % of acid.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF AUSTRIAN AND HUNGARIAN TYPE—RED.

Number	Locality.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copier Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
	Kadarkas.										
1307	Cupertino	1890	21.30		.72	.27	10.36	.138	.62	.40	2.58
2042	Cupertino	1893	23.20		.57			.440			
1418	Mission San José	1890	25.85		.58	.28	12.82	.233	.62	.48	3.58
1787	Mission San José	1892	23.70		.68						
1986	Mission San José	1893	22.20	21.80	.68	.20	9.90	.371	.57	.54	3.10
2257	Mission San José	1894	20.85		.47			.149			
1461	Fresno	1891	23.70	23.13	.42						
	Average, Cupertino		**22.25**		**.64**	**.27**	**10.36**	**.289**	**.62**	**.40**	**2.58**
	Average, Mission San Jose		**23.15**	**21.80**	**.60**	**.24**	**11.36**	**.376**	**.59**	**.51**	**3.34**
	Grossblaue.										
1381	Mission San José	1890	25.10		.77	.27	12.54	.263	.62	.34	3.08
1604	Mission San José	1891	24.90	25.19	.54		12.73	.320	.45	.47	3.35
1768	Mission San José	1892	20.00	19.08	.83		10.42	.262	.77	.53	2.30
2253	Mission San José	1894	22.20		.68				.65		
1555	Paso Robles	1891	26.60		.36						
1751	Paso Robles	1892	22.60		.49						
1881	Paso Robles	1893	21.50	21.22	.76	.30	10.58	.182	.59	.59	3.20
1682	Tulare	1892	24.80		.33						
1937	Tulare	1893	25.00	24.64	.49	.43		.417			
2323	Tulare	1894	25.00		.46						
1829	Amador station	1893	21.95		.95			.451			
2285	Amador station	1894	25.45		.58						
2129	Cupertino	1893	23.70		.82			.249			
	Average, Mission San Jose		**23.10**	**23.13**	**.70**	**.27**	**11.89**	**.281**	**.62**	**.44**	**2.91**
	Average, Paso Robles		**23.56**	**21.22**	**.53**	**.30**	**10.58**	**.182**	**.59**	**.59**	**3.20**
	Average, Tulare		**24.93**	**24.64**	**.42**	**.43**		**.417**			
	Average, Amador station		**24.48**		**.70**			**.249**			

	Blue Portuguese.										
1206	Fresno	1890	24.25	23.81	.38	.63	*19.96	.160	.48	.41	*3.08
1262	Mission San José	1890	24.35		.45	.33	12.00	.217	.48	.50	2.58
1511	Mission San José	1891	24.35		.39		12.36	.327	.46	.42	3.35
1683	Mission San José	1892	22.15		.55		11.00	.252	.48	.50	2.12
1985	Mission San José	1893	27.40	27.25	.45		14.20	.400	.51	.47	3.30
2256	Mission San José	1894	23.70		.40				.38		
1365	Cupertino	1890	26.10		.39						
1399	Cupertino	1890	27.60		.50						
2038	Cupertino	1893	23.50		1.05			.451			
2113	Cupertino	1893	24.40		.56			.321			
1440	Tulare	1891	24.38		.30						
1618	Tulare	1892	24.35	22.20	.35	.50	11.45	.127	.32	.50	3.58
1813	Tulare	1893	19.30	18.89	.57	.44	9.27	.202	.47	.41	2.95
1815	Tulare	1893	20.04	20.00	.50	.48	9.73	.134	.47	.47	3.00
2137	Tulare	1894	24.45	24.22	.29	.42	11.50	.229	.43	.57	4.35
	Average, Mission San Jose		**24.39**	**27.25**	**.44**	**.33**	**12.39**	**.299**	**.46**	**.47**	**2.83**
	Average, Cupertino		**25.40**					**.386**			
	Average, Tulare		**22.50**	**21.32**	**.40**	**.46**	**10.48**	**.173**	**.42**	**.48**	**3.47**
	Zinfandel.										
1253	Fresno	1890	23.70	24.11	.54	.42	11.64	.199	.58	.45	2.78
1257	Amador station	1890	22.60		.55	.29	12.82	.241	.54	.50	2.82
1656	Amador station	1892	23.73		.69						
	Average, Amador station		**22.15**		**.62**	**.29**	**12.82**	**.241**	**.54**	**.50**	**2.82**

*Fortified.

B. WHITE-WINE GRAPES.

WHITE RHENISH TYPE.

The Rhenish grapes were among the first to be tried in California, and they have been tested, perhaps, more widely than any others. Very little wine, however, has been made in California that at all resembles the true Rhine wines. Many of our Riesling wines bear a much closer resemblance to Sauternes than to Rhine wines. This is to some extent due, as is generally understood by wine-growers, to the high percentage of sugar which the German grapes attain here at maturity. The problem, as generally understood, is to produce grapes which possess a moderate amount of sugar when perfectly ripe. The method of dilution with water before fermentation is, without doubt, incompatible with the production of the finest wines, but is probably less harmful to quality than is generally supposed, and if applied intelligently, and with a full knowledge and understanding of the conditions, will certainly result in much better wines than many California Rieslings.

Our failure to produce wines of the true Rhine-wine type is probably due more to the conditions of fermentation and treatment than to difference in must composition. Though most of the common German wines are very acid and of low alcoholic strength, the high-class wines are, in many cases, nearly or quite as high as our California Rieslings in alcohol, and no higher in acid. The slow, cool fermentation which the wines of Johannisberg and Steinberg undergo has doubtless much to do with their superior qualities. Our efforts, then, in California to produce similar wines should be directed toward temperature control and the elimination of injurious ferments.

JOHANNISBERG RIESLING.

(See Vit. Rept. 1885–86, p. 99.)

Synonyms: Weisser Riesling; Gentil aromatique.

Description.—Vine somewhat slender, with semi-erect canes; leaves of average size, thick, three or five lobed, petiolar sinus closed, upper surface dark green, glabrous and rugose, lower surface pale green and tomentose; bunch conico-cylindrical and compact; berries small, variable in size, spherical, punctate, sweet, and aromatic. The variety is easily distinguished from its less noble namesake, the Franken Riesling or Sylvaner, by its lobed and slightly pubescent, furzy leaves; it is also usually a slower grower and lighter bearer.

Of all the German varieties thus far tested in California, this is the one which has retained most of the qualities for which it is famous in its original district. This is true only of certain localities in California, where some good wines have been obtained from this variety, not, however, so delicate as the product of the Rhine district. It is a vigorous

and fairly healthy vine, though it does not always set well at flowering, and is subject to *oidium;* it is, however, a rather poor bearer. It gives best results on a granitic or schist formation, and will not thrive on undrained soils. It ripens during the second period. It requires long-pruning, and the green canes should be tied up, as they are very brittle and easily broken by the wind. With long-pruning the crop has been about two and a half tons per acre at Cupertino, and with short-pruning almost nothing.

The best results are obtained with this variety in the coolest localities, in parts of the Santa Cruz Mountains for example. The average must composition at Cupertino has been 22.5% of sugar and 0.53% of acid, and about the same at Mission San José. This is somewhat lower in sugar and higher in acid than the other German varieties have shown. The Johannisberger is the most aromatic of the German grapes, with the exception of the Traminer, and is the best suited to producing a satisfactory wine without blending; it ferments well and is a good keeper.

TABLE OF PRODUCTION.

JOHANNISBERG RIESLING.	Number of Vines.	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking.
1887—No. 741 (short-pruned). J. T. Doyle, Cupertino	20	10	0.5	Oct. 14
No. 742 (long-pruned). J. T. Doyle, Cupertino	20	123	6.1	Oct. 14
1888—No. 874 (short-pruned). J. T. Doyle, Cupertino	19	35	1.8	Oct. 1
No. 875 (long-pruned). J. T. Doyle, Cupertino	14	75	5.3	Oct. 1
1889—No. 1139. J. T. Doyle, Cupertino	20	210	10.5	Oct. 2

ANALYSES OF MUSTS AND WINES.

JOHANNISBERG RIESLING.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric, at 6 to 8 Months	WINE. Volatile Acid	WINE. Body	WINE. Ash
1885—No. 461.* Gundlach & Co., by Dr. E. J. Fraser, San Francisco						9.92	12.36	.56	.....	2.10	.21
1886—No. 487. J. T. Doyle, Cupertino	Sept. 23	20.40	18 48	.65	.27	7.78†	9.73	.60	.....	1.80	.....
No. 632.* J. Schramm, St. Helena						9.41	11.73	.56	.....	2.10	.15
No. 652.* Captain Niebaum, Napa						9.56	11.91	.61	.....	1.30	.37
No. 663.* H. W. Crabb, Oakville						10.07	12.50	.38	.....	2.60	.23
No. 538. D. C. Feely, Patchen	Oct. 17	19.30	18.29	.36	.26	7.09†	8.85	.55	.....	1.80	.....
1887—No. 742 (long-pruned) J. T. Doyle, Cupertino	Oct. 14	21.24	20.24	.43	.40	8.84	11.00	.54	.09	2.30	.....
No. 741 (short-pruned). J. T. Doyle, Cupertino	Oct. 14	23.49	.....	.50	.36	Blended		with	No.	761.	
1888—No. 862. J. Gallegos, Mission San José	Sept. 22	23.96	23.61	.46	.33	.....	.....	.....	.....	.....	.....
No. 874. J. T. Doyle, Expt. Plot, Cupertino	Oct. 1	22.05	23.13	.35	.31	8.98	11.18	.47	.....	2.10	.....
No. 875. J. T. Doyle, Expt. Plot, Cupertino	Oct. 1	22.40	22.67	.41	.29						
1889—No. 1068. John Gallegos, Mission San José	Sept. 9	21.95	21.38	.43	.31	8.48	10.58	.55	.....	2.07	.....
No. 1139. J. T. Doyle, Expt. Plot, Cupertino	Oct. 2	23.60	23.62	.60	.36	9.56	11.91	.52	.....	1.57	.....
1890—No. 1264. J. T. Doyle, Expt. Plot, Cupertino	Sept. 28	22.15	.....	.66	.26	9.78	12.18	.42	.....	2.40	.....
1891—No. 1490. Paso Robles station	Sept. 9	24.55	.....	.36	.....	.....	.....	.....	.....	.....	.....
1892—No. 1777. Mission San José	Oct. 13	22.60	.....	.62	.....	.....	.....	.....	.....	.....	.....
1893—No. 1994. Mission San José	Oct. 18	22.20	.....	.60	.....	.....	.....	.....	.....	.....	.....
No. 2033. J. T. Doyle, Cupertino	Oct. 30	23.70	.....	.65	.....	.....	.....	.....	.....	.....	.....

* Wines sent for examination.
† Analyses made in May, 1887.

RECORD OF TREATMENT.

No. 741. *Johannisberg Riesling*, from J. T. Doyle, Cupertino. Received October 18, 1887, in good condition, and very ripe. The grapes were from short-pruned vines, and were very sweet and showed less coulure than those from long-pruned vines. The must showed 23.49% of solid contents by spindle and 0.50% of acid. The grapes were fermented with No. 742.

No. 742. *Johannisberg Riesling*, from J. T. Doyle, Cupertino. Received October 18, 1887, in good condition, but somewhat unevenly ripened. The bunches showed somewhat more coulure than those from the short-pruned vines, but it was not very bad in either case. The must showed 21.24% of solid contents by spindle and 0.43% of acid. The temperature of the grapes at crushing was 70°, and the maximum, reached on the third day, was 85°. On the seventh day the wine was dry, and on the sixteenth day it was drawn off the thick lees.

At two months the wine was bright and with good aroma, full body, low acid, and well-developed vinosity. A month later it was racked again, and at eight months it was in good condition, with strong aroma and full flavor, pleasant acid, and, in general, of high quality.

No. 862. *Johannisberg Riesling*, from J. Gallegos, Mission San José. A sample for must analysis was received September 25, 1888, in fair condition. The must showed 23.96% of solid contents by spindle and 0.46% of acid.

No. 874. *Johannisberg Riesling*, from J. T. Doyle, Cupertino. Received October 2, 1888, in fair condition; the grapes were crushed, and in some boxes fermentation had already commenced. The bunches were rather looser than normal and the berries were very uneven in size. The must showed 22.05% of solid contents by spindle and 0.35% of acid.

No. 875. *Johannisberg Riesling*, from J. T. Doyle, Cupertino. This sample was from short-pruned vines and differed little from those from long-pruned vines. The must showed 22.41% of solid contents by spindle and 0.40% of acid.

Nos. 874 and 875. The grapes were crushed the day they arrived, but were not pressed until the following morning. The temperature of the grapes at crushing was 74°, and the maximum reached, on the third day, was 79.5°. The wine was dry on the ninth day.

At one month the wine was racked and taken to the cellar. At three months it was clear, with good aroma, and well advanced. Two months later it was pasteurized, and at eight months, when it was racked for the third time, was in good condition and exhibited an extremely marked aroma and pleasing taste. At eleven months it was bright, clean-tasting, and of very high quality. At fourteen months it was nearly or quite mature, and showed a remarkable bouquet. Some wine put in glass at the last racking was bright, clean-tasting, and agreeable, but less pleasing and well developed than the wine in keg. At seventeen months it was racked again, and at eighteen was bottled. At twenty-nine months the wine bottled at nine months had deposited a heavy sediment; it was possessed of high aroma, but the flavor was not good. That bottled at eighteen months was bright and had made no deposit; it had less of the natural grape aroma, but was mature and good. At four years that first bottled had developed into a fine wine, with rich bouquet and agreeable acid. The wine bottled earlier had improved, and was bright, but inferior to the other.

No. 1068. *Johannisberg Riesling*, from J. Gallegos, Mission San José. Received September 12, 1889, in fair condition; the grapes were mature, but some of them were a little moldy. The must showed 21.95% of solid contents by spindle and 0.43% of acid. The temperature of the grapes at crushing was 72°, and the maximum, reached on the third day, was 79°. The wine was dry on the sixth day, when it was drawn off the thick lees.

At one month the wine was almost clear, and showed very good flavor and aroma. A month later it was quite clear and was racked and taken to the cellar. At three months the wine was bright, with marked and pleasing aroma, full, characteristic flavor, but with rather a suspicious after-taste. The wine improved for the next six or eight months, but after that became slightly pricked, and deteriorated.

No. 1139. *Johannisberg Riesling*, from J. T. Doyle, Cupertino. Received October 4, 1889, in good condition, and quite mature. The bunches were small; the berries small and unequal. The must showed 23.6% of solid contents by spindle and 0.60% of acid. The temperature of the grapes at crushing was 71°, and the maximum, reached on the third day, was 79°.

At two months the wine was clear, of very light color, strong and characteristic aroma, pleasing and marked flavor, clean taste, and in general very good. At this time it was racked and taken to the cellar. At four months it had improved and was quite sound. At seven months it retained its good quality, and was racked for the third time. A month later it was quite clear, but had a slightly suspicious taste, so it was pasteurized. Tastings at one and two months after pasteurizing showed that the wine remained sound; but the wine which was put in a demijohn became the brighter and developed a higher quality. A year later the wine was still bright and good, but after that it deteriorated.

No. 1264. *Johannisberg Riesling*, from J. T. Doyle, Cupertino. Received October 2, 1890, in fair condition and ripe, but not very sweet. The must showed 22.15% of solid

contents by spindle. The fermentation lasted about eight days, reaching a maximum temperature of 81° on the fourth day.

At three weeks the wine was nearly clear; at seven weeks the lees showed a few filaments. At two months the wine was clear, with good flavor and aroma and full acid. At three months it was nearly bright, and had been racked twice; it had a high, agreeable bouquet and delicate flavor, clean taste and full acid. The lees showed a few lactic germs, but the taste was unaffected; it was pasteurized for safety. At seven months it was bright, of high quality and maturing well. At fourteen months it was clear, had full bouquet and flavor, but was slightly flat and not quite mature. At seventeen months it was racked for the fifth time and part of it bottled; the rest was bottled at twenty-five months. At twenty-seven months both wines were bright and of fair quality; that first bottled was not quite clean-tasting, while the second was a little exhausted.

No. 1490. *Johannisberger*, from Paso Robles station. A sample for must analysis arrived September 11, 1891, in good condition. The must showed 24.55 % of solid contents by spindle.

No. 1777. *Johannisberger*, from Mission San José. A sample for must analysis was received October 15, 1892, in good condition. The must showed 22.6 % of solid contents by spindle.

No 1994. *Johannisberger*, from Mission San José. A sample for must analysis was received October 19, 1893, in good condition. The bunches were small; the berries of medium size, highly flavored, and very ripe. The must showed 22.2 % of solid contents by spindle.

No. 2033. *Johannisberger*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were of medium size, more or less compact; the berries of medium size, juicy, thin-skinned, with full acid and not quite mature. The must showed 23.7 % of solid contents by spindle.

RED TRAMINER.

Synonyms: Savagnin Rose; Gentil Rose; Gewürz Traminer; Roth Edel.

Description.—Vine rather vigorous, with slender, spreading, short-jointed canes; leaves small, wider than long, three-lobed or without sinuses, nearly glabrous above and cobwebby below; bunches small, conical, close; berries small, nearly round, pink, juicy, sweet, and very aromatic.

The Traminer is one of the most widely ranging varieties of Europe, as the dozens of synonyms with which it is afflicted sufficiently attest. Under the name of Savagnin the white-fruited variation is common in eastern France, while the rose-fruited variation described above is common in many parts of Germany and Austria. The vine is not very productive, but gives a wine of very marked character, and the grapes are generally fermented with the Franken Riesling or other neutral grape. On account of its thick skin, which protects it from decay, it is often used for the manufacture of "vins de paille."

Where tested in California it has shown itself a shy bearer and requires long-pruning. It retains the high flavor which distinguishes it in Europe, and well maintains its character as the most aromatic of the German grapes. When mature, the grapes have, as in Europe, low acid, viz., 0.3% to 0.5%, but are much higher in sugar than is reported from there, viz., 24.0% to 28.0%. The wine is somewhat difficult to ferment and keep when used alone, but on account of its high aroma and high sugar content it makes an excellent blend with grapes of less flavor and more acid. At the Amador and Tulare stations it is a very shy bearer, and the grapes lose there most of their characteristic flavor. The grapes ripen a little later than the Ruländer and about the same time as the Johannisberger.

ANALYSES OF MUSTS AND WINES.

RED TRAMINER.	Date of Picking.	MUST.				WINE.			
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol. By Weight.	Alcohol. By Volume.	Total Acid as Tartaric, at Six to Eight Months.	Body.
1889—No. 1075. J. T. Doyle, Cupertino	Sept. 14	26.40	26.31	.41	.41	11.39	13.91	.50	2.65
1890—No. 1211. Margherita Vineyard, Fresno	Aug. 21	25.90	25.76	.52	.39	.....	.....	.....	.....
No. 1304. J. Gallegos, Mission San José	Oct. 5	25.10	.....	.38	.39	10.35	12.82	.42	2.15
1891—No. 1542. Paso Robles	Oct. 4	23.70	.....	.36	.....	.....	.....	.....	.....
1893—No. 1810. Amador	Aug. 29	23.50	.....	.50	.....	.....	.....	.....	.....
No. 2017. Mission San José	Oct. 25	25.65	24.53	.38	.26	11.23	13.73	.38	3.10
No. 2099. J. T. Doyle, Cupertino	Nov. 5	28.30	.....	.31	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1075. *Red Traminer*, from J. T. Doyle, Cupertino. Received September 17, 1889, in fair condition, but somewhat crushed. The bunches were very unequal in shape, sometimes simply cylindrical and sometimes very much winged; the berries were small and slightly oval, with thick but tender skin, varying in color from greenish-yellow to pink. The fermentation was normal and complete.

At one month the wine was still a little cloudy, but was quite dry and of agreeable flavor. A week later it was nearly clear, showed good aroma, clean taste, and good flavor. At six weeks it was racked and taken to the cellar. At four months it was clear, of golden color, with very pronounced and characteristic aroma, full flavor, clean taste, and low acid. It was a wine of high quality, with full alcohol and body. Two months later it was racked again, and at eight months the lees were examined and found to contain a few acetic ferments. The taste was unaffected, however, and at nine months the wine was bright, clean-tasting, and well developed; it was a wine of very marked character and good development. At twelve months it was bright, well matured, and tasted perfectly sound, and very aromatic and full flavored. At this date it was racked for the third time. At eighteen months it was bright, but had suffered from being in such a small keg. It had lost somewhat in aroma, but was still of high quality and rich flavor. Wine bottled at twelve months was bright, sound, and equal to that in the keg, but had deposited some sediment. The wine was all bottled at eighteen months. A year later both bottlings showed many of the qualities of a fine wine, but also the effect of having been made in too small quantity.

No. 1211. *Red Traminer*, from Margherita Vineyard, Fresno. A sample for must analysis was received August 23, 1890, in poor condition, overripe. The must showed 25.9% of solid contents by spindle.

No. 1304. *Red Traminer*, from J. T. Doyle, Cupertino. Received October 8, 1890, in very good condition, all well colored and mature. The must showed 25.1 of solid contents by spindle. The fermentation lasted nine days, and was cool, reaching a maximum temperature of 76° on the third day.

At one month from crushing the wine was nearly clear, smooth, and with high aroma, but very raw. At three months the wine had been racked twice, but was not quite clear. The lees showed some lactic taint, which was also perceptible to the taste; the wine was therefore pasteurized. The wine was a long time clearing after being pasteurized, but it remained sound, and the lactic taint gradually disappeared. At the end of fifteen months it was clear and much improved, though somewhat flat. At seventeen months it was racked for the fifth time, and part of it put in bottle; the remainder was bottled at twenty-three months. At two years it was tasted, and neither sample found quite clear or clean-tasting; that first bottled had an extremely high and characteristic aroma, which was much less noticeable in that bottled later.

No. 1542. *Red Traminer*, from Paso Robles station. Received October 6, 1891, in good condition, mature, and highly flavored. The must showed 23.7 of solid contents by spindle. A sample for must analysis only was received.

No. 1810. *Red Traminer*, from Amador station. A sample for must analysis was received September 1, 1893, in good condition; the bunches were small, well filled, and without much of the characteristic flavor. The must showed 23.5 of solid contents by spindle.

No. 2017. *Red Traminer,* from Mission San José. Received October 26, 1893, in fair condition. The bunches were very small and well filled; the berries small, juicy, highly flavored, and very ripe. The must showed 25.65 % of solid contents by spindle. The fermentation was very slow and cool, and the wine never became perfectly dry. This sample was fermented with 36 % Ruländer. (See No. 2018.)

At five weeks from crushing the wine was not clear and was very sweet. At three months it was bright and sound, but still slightly sweet, and possessed of a very high aroma. At four months it was racked for the third time. At seven months it was bright, a little sweet, and had acquired a slight bitter taste.

No. 2099. *Red Traminer,* from J. T. Doyle, Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were of medium size, compact, with many abortive berries; the berries small to over-medium, thin-skinned, and very juicy, sweet, and mature. The must showed 28.3 % of solid contents by spindle.

RULÄNDER.

Synonyms: Pinot gris; Auvernat gris.

Description.—Vine of moderate size and vigor; leaves of medium size, round, three-lobed, distinguished from those of the Pinot noir by their yellowish color; bunches small, close, cylindrical; berries round, juicy, of a light, dull gray-purple.

This variety is considered by most authors as a simple color variation of the ordinary Pinot noir, but the grapes are more highly flavored, and the vine more productive. It bears somewhat better than the Traminer and attains an equally high percentage of sugar. It is considered in Germany as one of the best grapes for the production of sparkling wines, and is valued there for the high percentage of sugar which it attains.

In California its sugar content ranges from 23 % to 29 %. A sample from Cupertino, allowed to remain too long on the vines, attained 31 % of sugar with 0.48 % of acid. In general, it shows more acid than the Traminer, varying from 0.4 % to 0.6 %. At the Amador station it has borne well, and the must averaged 25.5 % of sugar and 0.53 % of acid. Its flavor is marked and characteristic, though less so than that of the Traminer. It ripens a week or ten days earlier than the latter, and is equally difficult to ferment alone, requiring the addition of some lighter must, such as Franken Riesling.

ANALYSES OF MUSTS AND WINES.

RULÄNDER (OF EUROPE).	MUST. Date of Picking.	Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	WINE. Alcohol. By Weight.	Alcohol. By Volume.	Total Acid as Tartaric, at Six to Eight Months.	Body.
1890—No. 1217. Margherita Vineyard, Fresno	Aug. 23	25.20	24.64	.41	.31				
No. 1274. J. T. Doyle, Cupertino	Oct. 1	23.36		.55	.29	10.16	12.64	.36	2.28
No. 1315. J. Gallegos, Mission San José	Oct. 9	26.50		.45	.24	12.23	15.00	.36	2.44
1893—No. 1802. Amador	Aug. 29	25.00		.56					
No. 2018. J. Gallegos, Mission San José	Oct. 25	28.60	28.02	.50	.20				
No. 2098. J. T. Doyle, Cupertino	Nov. 5	31.10		.48					
1894—No. 2231. Mission San José	Oct. 2	25.35		.55					
No. 2281. Amador	Oct. 4	24.35		.50					

RECORD OF TREATMENT.

No. 1217. *Rulánder*, from Margherita Vineyard, Fresno. A sample for must analysis was received August 25, 1890, in fair condition; overripe and somewhat crushed. The must showed 25.2% of solid contents by spindle.

No. 1274. *Rulánder*, from J. T. Doyle, Cupertino. Received October 2, 1890, in fair condition, somewhat bruised and with a few moldy berries; the bunches and berries were both small. The must showed 23.36% of solid contents by spindle. The fermentation was cool, and lasted over a week; the maximum temperature reached was 79°, on the fourth day.

The wine was nearly clear in three weeks, and quite clear in six. At two months it was a rich, generous wine, of marked flavor and aroma, medium acid, and good body and alcohol. After the third racking at six months it was bright, good, and sound, but had lost much of its striking aroma. At fourteen months it had lost still more of its distinctive character, but was still bright and sound. Some of the wine was bottled at fifteen and some at twenty-one months. At twenty-six months both wines were tasted, but neither of them had kept well; the second bottled was the best.

No. 1315. *Rulánder*, from Mission San José. Received October 10, 1890, in very bad condition—moldy and bruised. The must showed 26.5% of solid contents by spindle. The fermentation lasted a week, and attained its maximum temperature of 79° on the fourth day.

At one month the wine was clear, and showed a full and agreeable flavor, some aroma, low acid, and full body. At three months it was pasteurized, the lees showing lactic rods and the taste becoming affected. At seven months the slight lactic taste had disappeared, but the wine was a little flat. At fourteen months the wine was clear, with good bouquet and flavor, but with a slight bitter taste. At sixteen months the wine was bottled, having been racked five times. At twenty-seven months the bottled wine was not quite clear or clean-tasting, but had a full, rich flavor.

No. 1802. *Rulánder*, from Amador station. A sample for must analysis was received September 1, 1893, in good condition; the bunches were small, but well filled. The must showed 25.0% of solid contents by spindle.

No. 2018. *Rulánder*, from Mission San José. Received October 26, 1893, in fair condition. The bunches were very small and close; the berries small, juicy, thin-skinned, and of a dull purple-gray. The grapes were mature, and the must showed 28.6% of solid contents by spindle. This sample was fermented with No. 2017, Gewürz Traminer, from Mission San José.

No. 2098. *Rulánder*, from J. T. Doyle, Cupertino. A sample for must analysis arrived November 6, 1893, in good condition. The bunches were small, compact, with thick peduncles; the berries small, juicy, soft, shriveled, and overripe. The must showed 31.1% of solid contents by spindle.

FRANKEN RIESLING.

(See Vit. Rept, 1885–86, p. 98.)

Synonyms: Sylvaner blanc; Plant du Rhin.

The Franken Riesling is chiefly grown in the Austrian empire, but also on the Rhine, and in Alsace and France, where it bears the name of *Plant du Rhin*, *Auxerrois*, and many others. It is, therefore, a widely spread variety, and is especially adapted to the cooler and more exposed locations and poorer soils, where other vines would yield but an indifferent product. As its wine is rich in gummy ingredients, it is customary to ferment it with other good varieties, such as the true Riesling, Traminer, etc., in order to prevent its passing into the mucous fermentation. For the same reason, it is desirable to aërate the must before fermentation. The vine is easily recognized by its light green, round leaf, which is scarcely lobed.

Description.—Vine strong-growing and productive, with thick, erect, and somewhat short-jointed canes; leaves of medium size, round, puffy, entire or with two shallow lateral sinuses closed by the overlapping of the lobes, almost glabrous on both sides, teeth short and unequal; bunches of medium size, cylindrical or slightly conical, compact, on

short, thick peduncles; berries of medium size, round or deformed by pressure, firm, thick-skinned, punctate.

This variety has been rather extensively planted in California, and in some places has given good results. As distributed in this State it is often mixed with a large-leaved, very vigorous-growing variety, which nearly always loses its crop by coulure. The true Franken Riesling is a vigorous grower, with ample foliage, and, when long-pruned, a fair bearer. At Cupertino, with long-pruning, it has yielded an average of four and a half tons per acre, and with short-pruning only one tenth of that amount. Like most of the German varieties in California, it attains a higher percentage of sugar than in Germany; in acid, it generally runs higher than the Traminer and lower than the Johannisberger—about the same as the Zierfahndler.

Its average composition has been: at Cupertino, 23.6% of sugar and 0.43% of acid; at Mission San José, 21.1% of sugar and 0.48% of acid; at Paso Robles, 23.0% of sugar and 0.46% of acid. The must is somewhat difficult to ferment and slow in clearing, and it gives a wine of full flavor, though much less marked than that of the Johannisberger, but requires the addition of some better fermenter to produce the best results. In its native habitat it is usually associated with the true Riesling, the Traminer, and the Elbling.

TABLE OF PRODUCTION.

FRANKEN RIESLING.	Number of Vines.	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking.
1887—No. 699 (long-pruned). J. T. Doyle, Cupertino	20	166	8.3	Oct. 5
No. 713 (short-pruned). J. T. Doyle, Cupertino	20	20	1.0	Oct. 10
1888—No. 897 (long-pruned). J. T. Doyle, Cupertino	8	148	18.5	Oct. 9
No. 898 (short-pruned). J. T. Doyle, Cupertino	20	30	1.5	Oct. 9
1889—No. 1129. J. T. Doyle, Cupertino	20	250	12.5	Oct. 1

ANALYSES OF MUSTS AND WINES.

FRANKEN RIESLING.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric, at 6 to 8 Months	WINE. Volatile Acid	WINE. Body	WINE. Ash	WINE. Sugar
1883—No. 94. Charles Krug, St. Helena		20.16	20.24	.52	.42	9.02	11.22	.38		1.57	.29	
1885—No. 342. J. Gallegos, Mission San José		21.47		.56	.39	8.48	10.58	.60	.37	3.82	.27	.65
No. 365. D. C. Feely, Patchen		21.16		.45	.32	9.05	11.27	.35		1.80	.16	
1886—No. 474. J. Gallegos, Mission San José	Sept. 10	19.70		.59	.33							
No. 491. J. T. Doyle, Cupertino	Sept. 21	18.60	18.58	.51	.27	7.09	8.85	.56		1.80		
1887—No. 699 (long-pruned). J. T. Doyle, Cupertino	Oct. 5	23.83	24.01	.45	.40	10.26	12.73	.60	.09	2.30		
No. 713 (short-pruned). J. T. Doyle, Cupertino	Oct. 10	26.06	26.12	.40	.46							
1888—No. 885. J. Gallegos, Mission San José	Oct. 2	22.15	21.96	.30	.35	7.64	9.54	.60		1.80		
No. 897 (long-pruned). J. T. Doyle, Cupertino	Oct. 9	24.36	25.19	.32	.37	10.07	12.54	.55		2.00		
No. 898 (short-pruned). J. T. Doyle, Cupertino	Oct. 9	23.56	23.81	.31	.38							
No. 929 (Riesling). W. G. Klee, Santa Cruz	Oct. 22	20.29	20.24	1.08	.25	8.20	10.25	.68		2.70		
1889—No. 1129. J. T. Doyle, Cupertino	Oct. 1	25.10	24.97	.48	.31	10.26	12.73	.33		2.05		
1890—No. 1273. J. T. Doyle, Cupertino	Sept. 29	21.92		.50	.24	8.91	11.09	.33		1.80		
1891—No. 1494. Paso Robles	Sept. 13	20.40		.48								
No. 1501. Asti, Sonoma County	Sept. 22	24.40	23.90	.50	.40	9.92	12.36	.38		2.05		
1892—No. 1642. Paso Robles	Sept. 13	23.70		.48								
No. 1734. Paso Robles	Oct. 11	25.90		.32								
1893—No. 1805. Amador station	Aug. 29	21.70		.64								
No. 1883. Paso Robles	Sept. 19	21.50	20.24	.55	.32	7.09	8.85	.50		1.80		
No. 2035. J. T. Doyle, Cupertino	Oct. 30	25.45		.46								
1894—No. 2284. Amador station	Oct. 4	26.30		.51								

RECORD OF TREATMENT.

No. 699. *Franken Riesling*, from J. T. Doyle, Cupertino. Received October 6, 1887, in good condition. The grapes were from long-pruned vines. The bunches were of fair size, the berries large and characteristically spotted. There were very few dried berries and very little coulure. The must showed 23.83 % of solid contents by spindle and 0.45 % of acid. The temperature of the grapes at crushing was 70°, and the maximum, reached on the third day, was 87°. The fermentation was over on the fourth day. During the fermentation the wine was thoroughly aërated once a day.

At two weeks the wine was drawn off the thick lees, and at two months it was bright, showed good Riesling aroma, and medium acid. Three weeks later the microscope showed the lees to be unsound, so the wine was racked off and pasteurized. The wine after this improved and remained clear for four or five months, after which it deteriorated.

No. 713. *Franken Riesling*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 14, 1887, in excellent condition. The grapes were from short-pruned vines. The bunches were loose and showed a considerable amount of coulure; the berries were of extra size, with the exception of a few abortive ones, and there were fewer dried and shriveled berries than in the long-pruned sample. The must showed 26.06 % of solid contents by spindle and 0.40 % of acid.

No. 885. *Franken Riesling*, from J. Gallegos, Mission San José. Received October 5, 1888, in fair condition. The bunches were cylindrical and compact, the berries large. The must showed 22.15 % of solid contents by spindle and 0.30 % of acid. The temperature of the grapes at crushing was 67.5°, and the maximum, reached on the third day, was 80°. The fermentation was over on the tenth day, and the wine was drawn off the thick lees.

At one month the wine was racked and taken to the cellar. At three months it was nearly clear, with marked and very pleasant aroma. Two months later the wine was pasteurized, as the lees showed unsound ferments. At eight months, when the wine was racked for the third time, it was in good order and of pleasing flavor, but little bouquet. Two months later it was in good order, pleasing, clean-tasting, and of fair quality, but lacking in bouquet. After this the wine improved, developed some bouquet, and was at its best at about sixteen months.

No. 897. *Franken Riesling*, from J. T. Doyle, Cupertino. Received October 10, 1888, in good condition and fully ripe. The bunches, which were typical, showed very little coulure, but some dried grapes. The must showed 24.36 % of solid contents by spindle and 0.32 % of acid. The grapes, which were from long-pruned vines, were mixed with No. 898, the same variety from short-pruned vines, and fermented, as shown in the record given below.

No. 898. *Franken Riesling*, from J. T. Doyle, Cupertino. Received October 10, 1888, in good condition. The grapes, which were from short-pruned vines, showed more coulure than the sample from long-pruned vines. The must showed 23.56 % of solid contents by spindle and 0.31 % of acid. The temperature of the grapes at crushing was 76°, and the maximum, reached on the third day, was 85°. Mixed with No. 897 and fermented, with the following record:

Nos. 897 and 898. At three weeks the wine was racked and taken to the cellar. At three months it showed high quality. Two months later it was pasteurized. At ten months it was clear, rather too yellow in color, with marked and agreeable flavor and bouquet, good body, acid, and alcohol. Three months later it was still very good, but slightly pricked. It remained good until the age of sixteen months, after which it deteriorated, on account of the smallness of the sample.

No. 929. *Riesling*, from W. G. Klee, Glenwood, Santa Cruz County. Received October 24, 1888, in good condition. The bunches were small and loose; the berries small, round, and spotted. The grapes showed a little coulure. The must showed 20.29 % of solid contents by spindle and 1.08 % of acid. The temperature of the grapes at crushing was 70°, and the maximum, reached on the fourth day, was 81°. The must fermented slowly, and at three weeks it was nearly through and was racked off.

At one month the wine was taken to the cellar. At three months the wine tasted green and did not show much aroma; at this time it was pasteurized. At six months the wine was racked for the third time, and at ten months it was in good condition, of light golden color, clean taste, pleasing flavor, and full acid; it had developed a good bouquet. At fourteen months it tasted nearly mature. At sixteen months the wine was very good, and tasted mature, was rather light, and had very full acid; in general, it was very agreeable, and a good imitation of a Rhine wine. Five months later the wine retained its good quality. At two years it was bottled. At twenty-seven months the bottled wine was clear and agreeable, but rather thin. Some wine which had been bottled at six months and rebottled at seventeen months showed more character of flavor and aroma, but was not quite clean-tasting. Eighteen months later both wines were good, but the second bottling was the better.

No. 1129. *Franken Riesling*, from J. T. Doyle, Cupertino. Received October 3, 1889, in very good condition, and completely mature. The bunches varied in size and compactness; the berries were of unequal size, but generally above the average. The must

showed 25.1% of solid contents by spindle and 0.48% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 85°, on the second day. The wine was dry on the fifth day, when it was drawn off the thick lees.

At seven weeks the wine was nearly clear, of very light color, smooth, and agreeable; it was racked and taken to the cellar. At three months it was in good condition, without marked flavor or aroma, but agreeable, solid, and sound. At seven months it was racked for the third time, and was bright and sound. At fifteen months it was perfectly bright and sound, had developed a good bouquet, and tasted very clean and mature. Two months later it was bottled in part, and at twenty-two months the rest was bottled. At twenty-nine months the wine bottled at seven and that bottled at twenty-two months had deteriorated, but that bottled at seventeen months was very good. One year later the last wine was little changed, but was good, though lacking in bouquet.

No. 1273. *Franken Riesling*, from J. T. Doyle, Cupertino. Received October 2, 1890, in fair condition, a few rotten and moldy bunches; grapes of fair size, and mature. The must showed 21.92% of solid contents by spindle. The fermentation lasted seven days, reaching the maximum temperature of 80° on the fourth day.

The wine cleared slowly, and fermented gently for several weeks. At two months from crushing it had been racked twice, but was not quite clear; it was smooth, with good body and moderate acid. At three months it was racked again, but was not perfectly clear. At five months the lees showed a few lactic filaments, but the taste was unaffected; it was pasteurized for safety. Even after pasteurizing it was slow in clearing, and remained flat and insipid for some time. At fourteen months the taste had improved slightly, but the wine was not quite clear and had no bouquet. At sixteen months the wine was bottled. At twenty-seven months the bottled wine was bright, but flat and exhausted.

No. 1494. *Franken Riesling*, from Paso Robles station. A sample for must analysis was received September 16, 1891, in good condition, and mature. The must showed 20.4% of solid contents by spindle.

No. 1501. *Franken Riesling*, from Asti, Sonoma County. Received September 25, 1891, in good condition. The must showed 24.4% of solid contents by spindle. The fermentation was cool and prolonged, reaching a maximum temperature of 79° on the third day, and lasting over ten days.

At one month the wine was quite dry, but still cloudy. At two months it was nearly clear and full flavored. At three months it was racked for the third time, being clear, but still very raw and undeveloped. At five months it was bright and much improved, was smooth and pleasing, with full bouquet and flavor. At sixteen months it was bottled, being still a good wine, but with a somewhat suspicious after-taste.

No. 1642. *Franken Riesling*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 23.7% of solid contents by spindle.

No. 1734. *Franken Riesling*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 25.9% of solid contents by spindle.

No. 1805. *Franken Riesling*, from Amador station. A sample for must analysis arrived September 1, 1893, in good condition. The bunches and berries were small and fairly well flavored; a few grapes were sunburned. The must showed 21.7% of solid contents by spindle.

No. 1883. *Franken Riesling*, from Paso Robles station. Received September 21, 1893, in good condition. The bunches were small and compact; berries of medium size, soft, and with little flavor. The grapes were mature, but not very sweet. The must showed 21.5% of solid contents by spindle. The fermentation lasted eight days, reaching its maximum temperature of 78° on the second day.

In three weeks the wine was clear, and was racked for the second time. At four months the wine was bright, of good bouquet and flavor, and generally a very smooth and agreeable wine. At eight months it had been racked three times; it was very good, and showed signs of maturing quickly.

No. 2035. *Franken Riesling*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were compact and under medium size; the berries over medium size, pulpy, with good, but not high flavor; the grapes were mature. The must showed 25.45% of solid contents by spindle.

ORLEANS.

Synonyms: Orleaner; Gros Riesling; Orleans Riesling.

Description.—Vine fairly vigorous when grown on suitable soil; leaves of medium size, longer than wide, glabrous on both surfaces, except for some rough hairs on the nerves below, three to five lobed, the upper sinuses very deep, the lower scarcely marked; bunches of medium size, conico-cylindrical, somewhat close; berries over average size, slightly ovoid, juicy, but with firm flesh and rather thick skin; without special aroma; ripening in the second epoch, a week or two after the Riesling.

This variety is grown throughout the Palatinate and the Rhingau, but above all at Rudesheim, where it makes wines which are only second to those of the true Rieslings in celebrity. It is one of the most anciently known grapes of Germany, but has been very generally replaced by the Johannisberger. It is, in general, a better bearer than the true Rieslings, and does not require long-pruning.

At the Amador station it has shown itself to be a moderate grower, with upright canes, and a good, regular bearer. It succeeds there better in a granite soil, with a northern exposure, than in a warmer red soil. At Tulare, in an alkali soil, it is a poor grower, and though it shades its grapes well and produces good-sized, well-filled bunches, the crop is small and the must is very deficient in acid.

ANALYSES OF MUSTS.

		Date of Picking.	Solid Contents by Spindle.	Acid as Tartaric.
1893—No. 2031.	Cupertino	Oct. 29	26.50	.54
1894—No. 2141.	Amador station	Sept. 11	26.50	.47
No. 2311.	Tulare	Oct. 11	24.90	.24

KLEINBERGER.

(See Vit. Rept. 1885–86, p. 95.)

Synonyms: Weisser Elbling; Putzscheer; Gouais blanc.

Description.—Vine strong-growing and durable, with rough bark; leaves large, coarse, slightly or not at all lobed, round, dark green above, a little woolly below; bunches of medium size, conical, compact or often loose, and with many small, abortive berries; berries over medium size, thin-skinned, very juicy, without special flavor, and ripen about the third period.

This is one of the most widely distributed varieties in the northern and central wine-growing districts of Europe, and owes its popularity principally to its heavy-bearing qualities. It is the true white Burger of Germany, and has, in some respects, given more satisfaction here than the California Burger. It bears less here and requires long-pruning, but gives a wine of higher quality.

At Cupertino the average crop of long-pruned vines has been 5 tons per acre, and of short-pruned vines only 1.7 tons. In Tulare the crop has been light for the locality, viz., 3.6 tons; at the Amador station it has proved a fair bearer.

In Germany the grapes attain but a very low percentage of sugar with very high acid, but here they generally develop more sugar and less acid than the Burger. In the central coast counties it ranges from 22% to 26% of sugar and 0.45% to 0.60% of acid. At Tulare it has averaged 24% of sugar and 0.48% of acid; at the Amador station it goes even higher in sugar, with an equal amount of acid.

The best results with this variety have been obtained at Mission San José, where it makes a good, clean wine, without much character, but fermenting easily, maturing early, and developing some bouquet. At Tulare it makes a fair wine, but no better than others which produce larger crops.

One of its greatest defects is the thinness of the skin of the grape, which renders it very susceptible to damage from bad weather or rough handling.

TABLE OF PRODUCTION.

KLEINBERGER.	Number of Vines	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking
1887—No. 715 (long-pruned). J. T. Doyle, Cupertino	20	110	5.5	Oct. 11
No. 764 (short-pruned). J. T. Doyle, Cupertino	20	20	1.0	Oct. 20
1888—No. 865 (short-pruned). J. T. Doyle, Cupertino	19	153	8.0	Sept. 26
No. 866 (long-pruned). J. T. Doyle, Cupertino	20	440	22.0	Sept. 26
1889—No. 1106. J. T. Doyle, Cupertino	20	320	16.0	Sept. 25

ANALYSES OF MUSTS AND WINES.

KLEINBERGER.	Date of Picking.	MUST. Solid Contents by Spindle.	MUST. Sugar by Copper Test.	MUST. Acid as Tartaric.	MUST. Ash.	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Total Acid as Tartaric, at 6 to 8 Months.	WINE. Body.	WINE. Ash.
1886—No. 488. J. T. Doyle, Cupertino	Sept. 21	17.60	17.22	.49	.25	6.75	8.46	.47	1.80	.....
1887—No. 715 (long-pruned). J. T. Doyle, Cupertino	Oct. 11	23.40	23.61	.42	.42	9.70	12.09	.39	2.60	.....
No. 764 (short-pruned). J. T. Doyle, Cupertino	Oct. 18	24.70	.....	.52	.....	Blended with No. 761.				
1888—No. 865 (short-pruned). J. T. Doyle, Cupertino	Sept. 26	22.69	23.13	.46	.36	8.70	10.83	.46	2.60	.....
No. 866 (long-pruned). J. T. Doyle, Cupertino	Sept. 26	21.35	21.14	.44	.36	8.34	10.42	.52	2.05	.....
1889—No. 1088. J. Gallegos, Mission San José	Sept. 17	23.70	24.12	.55	.38	9.63	12.00	.53	2.85	.....
No. 1106. J. T. Doyle, Cupertino	Sept. 26	23.90	24.12	.45	.36	9.92	12.36	.53	2.50	.....
1890—No. 1222. Margherita Vineyard, Fresno	Aug. 22	23.05	23.13	.54	.33	.....	.....	.....	.....	.....
No. 1282. J. T. Doyle, Cupertino	Oct. 1	20.60	.....	.50	.31	8.84	11.00	.40	2.32	.....
No. 1299. J. Gallegos, Mission San José	Oct. 4	23.70	.....	.60	.....	.....	.....	.....	.....	.....
1891—No. 1578. Mission San José	Oct. 13	26.50	24.96	.50	.36	10.35	12.82	.49	2.55	.....
1892—No. 1645. Paso Robles	Sept. 13	21.50	.....	.69	.....	.....	.....	.....	.....	.....
No. 1712. Mission San José	Oct. 3	24.35	24.20	.63	.33	8.70	10.83	.79	2.85	.....
1893—No. 1880. Paso Robles	Sept. 14	19.50	18.58	.59	.30	7.23	9.00	.60	2.10	.....
No. 1981. Tulare	Oct. 16	24.35	23.21	.50	.50	9.20	11.45	.57	3.10	.....
No. 1990. Mission San José	Oct. 18	23.50	22.67	.63	.....	9.05	11.27	.62	2.20	.....
No. 2100. J. T. Doyle, Cupertino	Nov. 4	25.90	.....	.53	.....	.....	.....	.....	.....	.....
1894—No. 2144. Amador station	Sept. 11	27.10	.....	.47	.....	.....	.....	.....	.....	.....
No. 2242. Mission San José	Oct. 3	23.90	.....	.45	.....	.....	.....	.....	.....	.....
No. 2341. Tulare	Oct. 17	24.80	.....	.39	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 715. *Kleinberger*, from J. T. Doyle, Cupertino. Received October 12, 1887, in fair condition, somewhat crushed. The grapes were crushed the day they arrived, and the must showed 23.4% of solid contents by spindle and 0.42% of acid. The grapes were from long-pruned vines. The normal berries were large, but were mixed with a great many small ones, showing late coulure to the extent of about 50%; they were very sweet, juicy, and with little acid, and some were dried up. The temperature of the grapes at crushing was 70°, and the maximum reached was 78°, on the third day. On the eighth day the wine was dry.

On the eighteenth day the wine was drawn off the thick lees. At two months it was bright, with good aroma, medium acid, and light body, altogether a good, well-flavored wine. A month later it was racked again. At eight months the wine had not improved; it was clear, but had a suspicious taste. A microscopic examination of the lees showed the presence of filaments, so the wine was racked and pasteurized, but did not improve afterward.

No. 764. *Kleinberger*, from J. T. Doyle, Cupertino. Received October 20, 1887, in fair condition, and crushed the following day. The bunches were nearly all very small, and the berries very uneven in size and degree of ripeness; some grapes were very large and many were small and abortive, some were overripe, and some underripe and very green and acid. The must showed 24.7% of solid contents by spindle and 0.52% of acid. The must was blended with No. 761.

No. 865. *Kleinberger*, from J. T. Doyle, Cupertino. Received September 28, 1888, in good condition. The grapes were from short-pruned vines. The bunches were well filled and the grapes ripe. The must showed 22.69% of solid contents by spindle and 0.46% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 83°, on the third day. The wine was drawn off the heavy lees on the seventh day, though it was still fermenting a little.

No. 866. *Kleinberger*, from J. T. Doyle, Cupertino. Received September 28, 1888, in fair condition, and mature. The grapes were from long-pruned vines; they were crushed the day they arrived. The bunches were very uneven as regards form and size, and showed some late coulure; the berries varied much as to size and degree of ripeness. The must showed 21.35% of solid contents by spindle and 0.44% of acid. The temperature of the grapes at crushing was 67°, and the maximum reached was 84°, on the third day. The wine was drawn off the heavy lees on the eighth day, though still fermenting very slowly.

At one month the wine was racked again and taken to the cellar. At three months it was still cloudy, but tasted agreeable; it was better than No. 865, and gave promise of being a good blending wine. Two months later it was racked again and the lees examined. A month later it was not quite clear, but had developed some bouquet. At eleven months it was clear but not bright, very light colored, with marked bouquet and pleasing flavor, clean-tasting, and in general good. Four months later some wine which had been kept in a demijohn was tasted, and found to be almost as good as that in the keg, but not quite clean-tasting. At seventeen months it was bright, fresh, and clean-tasting, much better than No. 865, which had deteriorated, owing, doubtless, to the small size of the keg in which the latter was kept. At this date it was racked again, and four months later a microscopic examination of the lees showed them to be quite sound. At this date the wine was in good condition, and was of fairly good quality, with good bouquet.

No. 1088. *Kleinberger*, from J. Gallegos, Mission San José. Received September 19, 1889, in rather poor condition, and crushed the same day. The bunches were of medium size, cylindrical, and close; the berries large but unequal, round, with thin and tender skin, soft, juicy, and mature. The must showed 23.7% of solid contents by spindle and 0.55% of acid. The temperature of the grapes at crushing was 72°, and the maximum reached was 83°, on the third day. The wine was quite dry on the sixth day, and was drawn off the thick lees.

At one month the wine was nearly clear and showed some aroma, but was not very agreeable to the taste. At six weeks it was racked and taken to the cellar. At four months an examination of the lees showed them to be sound. At six months the wine was racked again, and at nine months it was bright and of fair quality, of good flavor, but lacking in bouquet, and not quite clean-tasting. Later, the wine deteriorated.

No. 1106. *Kleinberger*, from J. T. Doyle, Cupertino. Received September 27, 1889, in good condition, but rather overripe. The grapes agreed with Pulliat's description, but were rather irregular. The must showed 23.9% of solid contents by spindle and 0.45% of acid. The temperature of the must at crushing was 65°. The must was fermented in a keg surrounded by a jacket of water, which was kept at a temperature of 65°. The maximum temperature reached by the must was 70°, on the fourth day. On the fourth day the wine was transferred to another keg and put in the cellar.

At three weeks the wine was racked. At five weeks it was bright, of very light greenish color, of faint but agreeable bouquet, neutral flavor, and clean taste. At two months it was racked again. At four months it was in good condition, somewhat deeper in color than at last tasting, of good quality. The lees were examined at four and at

eight months, and found to be sound. At eight months the wine was racked again, and at nine months it was clear, with pleasing bouquet and flavor, agreeable acid, and in general a good wine. At eleven months is was racked again; it was still good, but had a slight taste of mold. At sixteen months it was bright, with little bouquet, good flavor, body, and alcohol. At seventeen months the wine bottled at nine months was bright and equal to that in the keg, but had a little more of the moldy taste. At this date the wine was all bottled. A year later the wine first bottled showed that but for the moldy taste it would have been an excellent light wine of neutral character. The wine bottled later was cleaner-tasting and very drinkable, though with little character.

No. 1222. *Kleinberger*, from Margherita Vineyard, Fresno. A sample for must analysis arrived August 23, 1890, in fairly good condition, slightly overripe. The must showed 23.05 % of solid contents by spindle.

No. 1282. *Kleinberger*, from J. T. Doyle, Cupertino. Received October 3, 1890, in very bad condition, many grapes moldy and rotten. The must showed 20.6 % of solid contents by spindle. The fermentation was slow, and lasted about twelve days; it reached its maximum temperature of 82° on the third day.

Three weeks after crushing the wine was nearly clear, but had a moldy taste. At two months it was clear and the moldy taste was much diminished. At three months the wine was bright, and had been racked three times. At six months it was bright and tasted sound, but a little flat. At fourteen months it was much improved, was well flavored, mature, and with a little bouquet. At sixteen months some of it was bottled, and the rest at twenty months. At two years both wines were clear, but not bright; they were smooth and drinkable, but without distinctive character; that bottled at sixteen months was not quite clean-tasting.

No. 1299. *Kleinberger*, from Mission San José. A sample for must analysis arrived October 6, 1890, in very bad condition—too moldy to be worth making into wine. The must showed 23.7% of solid contents by spindle.

No. 1578. *Kleinberger*, from Mission San José. Received October 16, 1891, in poor condition. The must showed 26.5 % of solid contents by spindle. The fermentation lasted five days, reaching its maximum temperature of 82° on the third day.

In one month the wine was bright and showed good flavor and body. At five months it showed signs of maturing quickly, developed some bouquet, and was, in general, a good wine. It was racked four times during the first year, and at fourteen months tasted quite mature and was in first-class condition. At fifteen months it was bottled.

No. 1645. *Kleinberger*, from Paso Robles station. A sample for must analysis arrived September 16, 1892, in good condition. The must showed 21.5 % of solid contents by spindle.

No. 1712. *Kleinberger*, from Mission San José. Received October 6, 1892, in poor condition; nearly all the grapes were small and abortive. The must showed 24.35 % of solid contents by spindle. The fermentation lasted nine days, and the maximum temperature of 80° was reached on the fourth day.

At one month the wine was clear and fresh-tasting. It was racked twice during the first three months, at the end of which time it was bright, with good bouquet, but little flavor, full acid; generally, a light, clean-tasting wine, of fair quality. At five months it showed signs of a slight acetification, due to the smallness of the sample. It was bottled at fourteen months.

No. 1880. *Kleinberger*, from Paso Robles station. Received September 16, 1893, much bruised, but not moldy, of good size, and the bunches well filled; mature, but lacking in sweetness. The must showed 19.5 % of solid contents by spindle. The fermentation lasted four days, and reached its maximum temperature of 82° on the second day.

The wine was clear in three weeks, when it was racked for the second time. At three months it was bright, with some flavor and a little bouquet, good acid, and clean taste. At seven months, one month after the third racking, it was bright, pleasant, and showed signs of a quick maturity.

No. 1981. *Kleinberger*, from Tulare station. Received October 18, 1893, in good condition. The bunches were close and of medium size; the berries of medium size, thin-skinned, juicy, ripe, and with little flavor. The must showed 24.35 % of solid contents by spindle. The fermentation was cool, and lasted five days.

At one month after crushing the wine was clear, with clean taste and good acid. At three months it was bright, with some bouquet and flavor, and in general the best of the Tulare white wines of this year, but, like the rest, lacking in freshness of taste. At six months it remained an agreeable wine, but had acquired a slight odor of acetic acid, on account of being in so small a keg.

No. 1990. *Kleinberger*, from Mission San José. Received October 19, 1893, in good condition. Bunches of medium size and close; berries of medium size, soft, thin-skinned, very juicy, mature. The must showed 23.5 % of solid contents by spindle. The fermentation lasted five days, attaining its maximum temperature of 81° on the third day.

The wine was clear at one month, and was racked twice during the first three months, at the end of which time it was bright, clean-tasting, with little character, but fresh and

with pleasing acid. After the third racking, at six months, it showed little change, but had a faintly bitter after-taste.

No. 2100. *Kleinberger*, from J. T. Doyle, Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were of medium size, compact, with a good many abortive berries; berries small to over-medium, thin-skinned, very juicy, sweet, mature. The must showed 25.9 % of solid contents by spindle.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF WHITE RHENISH TYPE.

Number	LOCALITY.	Vintage of	MUST.				WINE.		
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Total Acid as Tartaric, at 6 to 8 Months	Body
	Johannisberg Riesling.								
487	Cupertino	1886	20.40	18.48	.65	.27	9.73	.60	1.80
742	Cupertino. (Long-pruned)	1887	21.24	20.24	.43	.40	11.00	.54	2.30
741	Cupertino. (Short-pruned)	1887	23.49		.50	.36			
874	Cupertino	1888	22.05	23.13	.35	.31			
875	Cupertino	1888	22.40	22.67	.41	.29	11.18	.47	2.10
1139	Cupertino	1889	23.60	23.62	.60	.36	11.91	.52	1.57
1264	Cupertino	1890	22.15		.66	.26	12.18	.42	2.40
2033	Cupertino	1893	25.70		.65				
862	Mission San José	1888	23.96	23.61	.46	.33			
1068	Mission San José	1889	21.95	21.38	.43	.31	10.58	.55	2.07
1777	Mission San José	1892	22.60		.62				
1994	Mission San José	1893	22.20		.60				
1490	Paso Robles	1891	24.55		.36				
632	St. Helena	1886					11.73	.56	2.10
652	Napa	1886					11.91	.61	1.30
538	Patchen	1886	19.30	18.29	.36	.26	8.85	.55	1.80
663	Oakville	1886					12.50	.38	2.60
	Average, Cupertino		**22.64**	**21.63**	**.54**	**.32**	**11.20**	**.49**	**2.03**
	Average, Mission San Jose		**22.68**	**22.49**	**.42**	**.32**	**10.58**	**.55**	**2.07**
	Red Traminer.								
1075	Cupertino	1889	26.40	26.31	.41	.41	13.91	.50	2.65
2099	Cupertino	1893	28.30		.31				
1211	Fresno	1890	25.90	25.76	.52	.39			
1304	Mission San José	1890	25.10		.38	.39	12.82	.42	2.15
2017	Mission San José	1893	25.65	24.53	.38	.26	13.73	.38	3.10
1542	Paso Robles	1891	23.70		.36				
1810	Amador station	1893	23.50		.50				
	Average, Cupertino		**27.35**	**26.31**	**.36**	**.41**	**13.91**	**.50**	**2.65**
	Average, Mission San Jose		**25.38**	**24.55**	**.38**	**.33**	**13.28**	**.40**	**2.67**
	Ruländer.								
1217	Fresno	1890	25.20	24.64	.41	.31			
1274	Cupertino	1890	23.36		.55	.29	12.64	.36	2.28
2098	Cupertino	1893	31.10		.48				
1315	Mission San José	1890	26.50		.45	.24	15.00	.36	2.44
2018	Mission San José	1893	28.60	28.02	.50	.20			
2231	Mission San José	1894	25.35		.55				
1802	Amador station	1893	25.00		.56				
2281	Amador station	1894	24.35		.50				
	Average, Cupertino		**27.23**		**.52**	**.29**	**12.64**	**.36**	**2.28**
	Average, Mission San Jose			**28.02**	**.50**	**.22**	**15.00**	**.36**	**2.44**
	Average, Amador station		**24.68**		**.53**				
	Franken Riesling.								
94	St. Helena	1883	20.16	20.24	.52	.42	11.22	.38	1.57
342	Mission San José	1885	21.47		.56	.39	10.58	.60	3.82
474	Mission San José	1886	19.70		.59	.33			
885	Mission San José	1888	22.15	21.96	.30	.35	9.54	.60	1.80
365	Patchen	1885	21.16		.45	.32	11.27	.35	1.80
491	Cupertino	1886	18.60	18.58	.51	.27	8.85	.56	1.80
699	Cupertino. (Long-pruned)	1887	23.83	24.01	.45	.40	12.73	.60	2.30

SUMMARY OF ANALYSES OF MUSTS AND WINES OF WHITE RHENISH TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Fehling's Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Total Acid as Tartaric, at 6 to 8 Months	WINE. Body
713	Cupertino. (Short-pruned)	1887	26.06	26.12	.40	.46			
897	Cupertino. (Long-pruned)	1888	24.36	25.19	.32	.37	12.54	.55	2.00
898	Cupertino. (Short-pruned)	1888	23.56	23.81	.31	.38			
1129	Cupertino	1889	25.10	24.97	.48	.31	12.73	.33	2.05
1273	Cupertino	1890	21.92		.50	.24	11.09	.33	1.80
2035	Cupertino	1893	25.45		.46				
929	Santa Cruz	1888	20.29	20.24	1.08	.25	10.25	.68	2.70
1494	Paso Robles	1891	20.40		.48				
1642	Paso Robles	1892	23.70		.48				
1734	Paso Robles	1892	25.90		.32				
1883	Paso Robles	1893	21.50	20.24	.55	.32	8.85	.50	1.80
1501	Asti, Sonoma County	1891	24.40	23.90	.50	.40	12.36	.38	2.05
1805	Amador station	1893	21.70		.64				
2284	Amador station	1894	26.30		.51				
	Average, Cupertino			**23.78**	**.43**	**.33**	**11.59**	**.47**	**1.99**
	Average, Mission San Jose			**21.96**	**.48**	**.36**	**10.06**	**.60**	**2.61**
	Average, Paso Robles		**22.87**	**20.40**	**.46**	**.32**	**8.85**	**.50**	**1.80**
	Average, Amador station		**24.00**		**.58**				
	Orleans.								
2031	Cupertino	1893	26.50		.54				
2141	Amador station	1894	26.50		.47				
2311	Tulare	1894	24.90		.24				
	Kleinberger.								
488	Cupertino	1886	17.60	17.22	.49	.25	8.46	.47	1.80
715	Cupertino. (Long-pruned)	1887	23.40	23.61	.42	.42	12.09	.39	2.60
764	Cupertino. (Short-pruned)	1887	24.70		.52				
865	Cupertino. (Short-pruned)	1888	22.69	23.13	.46	.36	10.83	.46	2.60
866	Cupertino. (Long-pruned)	1888	21.35	21.14	.44	.36	10.42	.52	2.05
1106	Cupertino	1889	23.90	24.12	.45	.36	12.36	.53	2.50
1282	Cupertino	1890	20.60		.50	.31	11.00	.40	2.32
2100	Cupertino	1893	25.90		.53				
1088	Mission San José	1889	23.70	24.12	.55	.38	12.00	.53	2.85
1299	Mission San José	1890	23.70		.60				
1578	Mission San José	1891	26.50	24.96	.50	.36	12.82	.49	2.55
1712	Mission San José	1892	24.35	24.20	.63	.33	10.83	.79	2.85
1990	Mission San José	1893	23.50	22.67	.63		11.27	.62	2.20
2242	Mission San José	1894	23.90		.45				
1222	Fresno	1890	23.05	23.13	.54	.33			
1645	Paso Robles	1892	21.50		.69				
1880	Paso Robles	1893	19.50	18.58	.59	.30	9.00	.60	2.10
1981	Tulare	1893	24.35	23.21	.50	.50	11.45	.57	3.10
2341	Tulare	1894	24.80		.39				
2144	Amador station	1894	27.10		.47				
	Average, Cupertino		**22.52**	**21.84**	**.47**	**.34**	**10.86**	**.46**	**2.31**
	Average, Mission San Jose		**24.27**	**23.99**	**.56**	**.36**	**11.73**	**.61**	**2.61**
	Average, Paso Robles		**20.50**	**18.58**	**.64**	**.30**	**9.00**	**.60**	**2.10**
	Average, Tulare		**24.57**	**23.21**	**.44**	**.50**	**11.45**	**.57**	**3.10**

WHITE BURGUNDY TYPE.

The fine white wines of Burgundy have a reputation which is hardly second to that of Sauterne or Rhine wines. They do not possess the marked and peculiar aroma which the latter obtain from the highly flavored Riesling and Sauterne grapes from which they are made. They are, however, wines of extreme delicacy of flavor, of great smoothness, full body, and high bouquet. The famous Montrachet takes rank with Château-Iquem and Johannisberger, while the wines of Chablis and Pouilly are of world-wide renown. The best of these wines are made from the Pinot blanc Chardonay grown at medium elevations on hillsides. The Chardonay loses its high character if grown on moist valley soils or in the warmest localities. The indications are that excellent wines of this type will be made in some of the coast counties, especially in warm, well-drained locations in late localities. The grapes ripen early and more evenly than the Semillon, but must be well cared-for to avoid sunburn and drying up. On the whole, the white Burgundy grapes have shown much more promise for California than the red; and the wines do not present the same difficulties in handling and aging.

PINOT BLANC.

Synonyms: Plant doré blanc; Auvernat blanc.

Description.—This grape is simply a white-fruited variation of the ordinary Franc Pinot, which it resembles almost exactly in all characters except the color of the grapes.

It is a true Pinot with all the characteristics of growth and habit of that group, and succeeds under the same conditions. Its product resembles that of the Chardonay, but is inferior to it in all respects. Its average crop at Cupertino has been about one and a half tons per acre. The grapes ripen earlier than those of the Chardonay, are inferior in flavor, but develop a higher sugar content; the average must composition has been: at Cupertino, 26.5% of sugar and 0.56% of acid; at Mission San José, 25.5% of sugar and 0.66% of acid. In Sonoma it attains even higher sugar content, and, like its congener, Pinot noir, fails to retain sufficient acid. The wine is not very robust, and, in general, seems to have no good qualities in which it is not surpassed by the Chardonay.

TABLE OF PRODUCTION.

PINOT BLANC.	Number of Vines	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking
1887—No. 777. J. T. Doyle, Cupertino	20	12	0.6	Oct. 25
1888—No. 845. J. T. Doyle, Cupertino	9	42	4.6	Sept. 13
1889—Row 46. J. T. Doyle, Cupertino	9	65	7.2	Sept. 20

ANALYSES OF MUSTS AND WINES.

PINOT BLANC.	Date of Picking	MUST. Solid Contents by spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	WINE. Ash	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric at 6 to 8 Months	WINE. Body
1887—No. 777. J. T. Doyle, Cupertino	Oct. 25	30.00	29.83	.50	.60	.....	.....	.....	.....
1888—No. 845. J. T. Doyle, Cupertino	Sept. 13	21.50	22.05	.45	.28	9.70	12.09	.51	2.60
1889—No. 1122. J. Gallegos, Mission San José	Sept. 30	25.90	26.12	.56	.35	*	.....	.....	.....
1890—No. 1337. J. T. Doyle, Cupertino	Oct. 10	25.90	.....	.50	.....	.....	.....	.....	.....
1891—No. 1517. Mission San José	Sept. 30	25.10	25.20	.75	.35	10.81	13.27	.57	2.10
No. 1593. A. Macartney, Los Guilicos	Oct. 16	26.80	25.19	.42	.36	12.15	14.90	.35	2.20
1892—No. 1621. Tulare	Aug. 28	25.20	.....	.39	.....	.....	.....	.....	.....
1893—No. 1944. Tulare	Oct. 15	25.00	.....	.45	.....	.....	.....	.....	.....
No. 2027. J. T. Doyle, Cupertino	Oct. 29	27.65	.....	.78	.....	.....	.....	.....	.....
1894—No. 2327. Tulare	Oct. 15	26.00	.....	.42	.....	.....	.....	.....	.....

*For analysis of wine, see No. 1121, Pinot Chardonay, from J. Gallegos, Mission San José.

RECORD OF TREATMENT.

No. 777. *Pinot blanc*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 26, 1887, in fair condition. The bunches were very uneven in size, and showed much early coulure; the berries showed very uneven ripening. The must showed 30.0 % of solid contents by spindle and 0.50 % of acid.

No. 845. *Pinot blanc*, from J. T. Doyle, Cupertino. Received September 14, 1888, in good condition. The bunches showed much early coulure. The must showed 21.5 % of solid contents by spindle and 0.45 % of acid. The fermentation lasted seven days, and reached its maximum temperature of 84° on the third day.

At three weeks the wine was racked for the second time and taken to the cellar. At four months it was nearly clear, of light aroma, pleasant acid and flavor, but not quite clean-tasting. The wine was pasteurized. At seven months it was clear and sound, and was racked again. At seventeen months it was bright and showed high quality, and was mature. A month later it was bottled. A year after bottling it was bright, of full and agreeable flavor, little bouquet, and lacking in freshness. At four years it was a very smooth, full-bodied wine, but rather lacking in bouquet and freshness.

No. 1122. *Pinot blanc*, from J. Gallegos, Mission San José. Received October 1, 1889, in good condition, and mature. The bunches were small, cylindrical, and loose, on thick peduncles, the berries of medium size. The must showed 25.9 % of solid contents by spindle. It was fermented with No. 1121, Pinot Chardonay, from Mission San José.

No. 1337. *Pinot blanc*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 13, 1890, in fair condition. The must showed 25.9 % of solid contents by spindle.

No. 1517. *Pinot blanc*, from Mission San José. Received October 1, 1891, in good condition, and mature. The must showed 25.1 % of solid contents by spindle. The fermentation lasted eleven days, and reached a maximum temperature of 77° on the fourth day.

At one month from crushing the wine was clear, but still a little sweet. At three months it had been racked twice, and was clear, fresh, and fruity, with some bouquet and flavor. At five months it was bright, with good aroma, but somewhat raw. At seven months it had been racked three times, and was in good condition, very fresh and richly flavored, but without very much bouquet. It was racked again at eleven months, and at sixteen months it was bottled.

No. 1593. *Pinot blanc*, from A. Macartney, Los Guilicos. Received October 19, 1891, in fair condition, mature, a little moldy. The fermentation was prolonged, lasting over two weeks; the maximum temperature of 80° was reached on the fifth day.

The wine remained slightly sweet for over a month, but in six weeks was clear and clean-tasting. At five months it had been racked three times, and was bright, very

fruity, and of high quality. At ten months it was racked for the fourth time. At sixteen months it was in good order, full-bodied, of high flavor and marked character; its only defect was a slight bitterness. A month later it was bottled.

No. 1621. *Pinot blanc*, from Tulare station. A sample for must analysis arrived September 1, 1892, in good condition. The must showed 25.2% of solid contents by spindle.

No. 1944. *Pinot blanc*, from Tulare station. A sample for must analysis arrived October 18, 1893, in good condition. The bunches were very small, irregular, and loose; the berries small, sunburned, and tasteless. The must showed 25.0% of solid contents by spindle.

No. 2027. *Pinot blanc*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 31, 1893, in good condition. The bunches were small, short, conico-cylindrical, close; the berries small, juicy, sweet, mature. The must showed 27.65% of solid contents by spindle.

PINOT BLANC CHARDONAY.

Synonyms: Melon; Epinette.

Description.—Vine more vigorous than most of the Pinots, with slender, yellowish, short-jointed canes; leaves small to medium, yellowish green, scarcely lobed and coarsely toothed; bunches small, conico-cylindrical, and compact; berries small, spherical, and with more flavor than the true Pinot blanc.

The grapes ripen a week or two later than those of the black Pinots. It is from this grape that the famous white wines of Montrachet, Chablis, and Pouilly are made. It is sometimes confused with the true Pinot, from which, however, it differs in its period of ripening (which is nearly two weeks later), the firmer flesh, and somewhat larger size of its berries, and its more pronounced flavor. It is said in France to be a less prolific bearer than the true Pinot blanc, but in California the contrary seems to be true.

The vine is a vigorous grower, free from disease, shades its grapes well, and does well on almost any well-drained soil, even on those which are too poor for most grapes. In rich valley soils it tends to go too much to wood, and requires very long canes. It is particularly suited to the northern coast counties; in Napa it is reported as producing from three to five tons per acre, doing best on the higher lands. The average crop for three years at Cupertino was 3.4 tons per acre. The average composition of the must at Cupertino and Mission San José has been 24.0% of sugar and 0.50% of acid. In the more southerly and central stations the sugar has been higher and the acid too low.

In the rich Tulare soils the crops have been small, and the grapes flavorless and injured by the sun. The wine obtained from this grape in suitable localities is well flavored, with good bouquet and body and sufficient alcohol. The points of superiority of this grape over the true Pinot Blanc are its better bearing qualities (in California), its superior aroma, and its greater adaptability to various soils.

TABLE OF PRODUCTION.

PINOT CHARDONAY.	Number of Vines.	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking.
1887—No. 776 (long-pruned). J. T. Doyle, Cupertino...	20	141	7.0	Oct. 25
1888—No. 849 (long-pruned). J. T. Doyle, Cupertino...	12	127	10.5	Sept. 17
1889—No. 1110 (long-pruned). J. T. Doyle, Cupertino...	10	120	12.0	Sept. 26

ANALYSES OF MUSTS AND WINES.

PINOT CHARDONAY.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	WINE. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric at Six to Eight Months	WINE. Volatile Acid	WINE. Body
1887—No. 776. J. T. Doyle, Cupertino	Oct. 23	25.65	25.19	.48	.32	9.70	12.09	.57	.05	2.60
1888—No. 849. J. T. Doyle, Cupertino	Sept. 17	21.50	22.05	.45	.28	8.34	10.42	.38	.....	2.45
No. 858. J. Gallegos, Mission San José	Sept. 24	24.24	24.54	.48	.39	9.92	12.36	.61	.....	2.80
1889—No. 1119. J. T. Doyle, Cupertino	Sept. 26	23.50	23.62	.41	.29	9.63	12.00	.53	.....	2.10
No. 1121. J. Gallegos, Mission San José	Sept. 29	25.00	24.97	.45	.42	10.16*	12.64	.45	.....	2.55
1890—No. 1375. J. T. Doyle, Cupertino	Oct. 14	21.30	.....	.70	.....	.....	.....	.....	.....	.....
No. 1357. J. Gallegos, Mission San José	Oct. 11	24.80	.....	.53	.....	.....	.....	.....	.....	.....
1891—No. 1520. J. Gallegos, Mission San José	Sept. 29	22.75	.....	.57	.....	.....	.....	.....	.....	.....
No. 1533. Paso Robles	Oct. 6	24.70	.....	.30	.....	.....	.....	.....	.....	.....
1892—No. 1622. Tulare	Aug. 29	24.35	.....	.47	.....	.....	.....	.....	.....	.....
No. 1735. Paso Robles	Oct. 10	25.90	.....	.43	.....	.....	.....	.....	.....	.....
1893—No. 1840. Amador station	Sept. 4	22.40	.....	.59	.....	.....	.....	.....	.....	.....
No. 1940. Tulare	Oct. 11	23.70	22.23	.43	.50	.....	.....	.....	.....	.....
No. 2093. Cupertino	Nov. 5	25.50	.....	.60	.....	.....	.....	.....	.....	.....
1894—No. 2161. Amador station	Sept. 19	26.10	.....	.47	.....	.....	.....	.....	.....	.....
No. 2237. Mission San José	Oct. 5	23.70	.....	.50	.....	.....	.....	.....	.....	.....
No. 2326. Tulare	Oct. 15	24.80	.....	.35	.....	.....	.....	.....	.....	.....

* Blended with No. 1122, Pinot blanc, from J. Gallegos, Mission San José.

RECORD OF TREATMENT.

No. 776. *Pinot Chardonay*, from J. T. Doyle, Cupertino. Received October 25, 1887, in fair condition. The bunches were of fair size and characteristic shape, well filled, but showing some early coulure; the berries were somewhat overripe and sunburned, very sweet, but with good acid. The must showed 25.65% of solid contents by spindle and 0.48% of acid. The temperature of the grapes at crushing was 76°, and the maximum reached was 84°, on the third day. The fermentation was over on the sixth day.

On the tenth day the wine was drawn from the lees. At eight weeks it was still a little cloudy, but showed good aroma and characteristic flavor; it was full-bodied and of medium acid. Three weeks later it was racked and pasteurized for safety. At three months and a half it was clear and had developed some bouquet; it had good body and full acid. At eight months the bouquet was much improved, but the wine was not quite clean-tasting.

No. 849. *Pinot Chardonay*, from J. T. Doyle, Cupertino. Received September 18, 1888, in fair condition. Most of the bunches were very compact, triangular, double shouldered or winged; some showed a great deal of early coulure and sunburn. The overripe and crushed berries were removed before crushing. The must showed 21.5% of solid contents by spindle and 0.45% of acid. The grapes were fermented with 11½ lbs. of the pomace of No. 835, Gamai Teinturier, from Cupertino, as a red wine.

At six weeks the wine was racked and taken to the cellar. At ten weeks it was clear, but lacking in color, showed good aroma, but was not quite clean-tasting. Seven weeks later it was pasteurized for safety. At eight and a half months it was racked and put in glass. It was clear and sound. At fifteen months it had improved, and tasted mature and finished. At seventeen months it was bright and sound, with faint bouquet and agreeable flavor, having the smoothness of a white wine. At two years and five months it had improved in bouquet, flavor, and general quality, and the color had become brighter.

No. 858. *Pinot Chardonay*, from J. Gallegos, Mission San José. Received September 25, 1888. The bunches were small and compact. The must showed 24.24% of solid contents by spindle and 0.48% of acid. The fermentation was made in a hot chamber at a temperature of 93°. The wine was poor from the start, and soon became quite spoiled.

No. 1110. *Pinot Chardonay*, from J. T. Doyle, Cupertino. Received September 27, 1889, in poor condition—crushed, shriveled, and overripe. The bunches were close and small to medium in size. The must showed 23.5% of solid contents by spindle and 0.41% of acid. The fermentation was violent, reaching a maximum temperature of 81.5° on the third day, and expelling much foam from the bung-hole.

In six weeks the wine was clear, with little aroma, but otherwise of very good quality. At four months it had improved; but as the lees showed unsound germs, the wine was pasteurized. Six weeks later it was bright, of pleasing flavor and delicate bouquet. At one year it was in good condition, of good bouquet, and mature. It was racked for the fourth time, and part put in bottle. Four months later the wine in wood was bright, of fine flavor, good body and acid, and well matured. The lees showed a good deal of *S. pastorianus*. At eighteen months the wine bottled at one year was bright, clean-tasting, and sound, of higher character than that in the keg; the rest was bottled at this time. A year later the wine first bottled was as good as before, while that bottled at eighteen months had deteriorated. At three years and five months little change was to be perceived in the wines.

No. 1121. *Pinot Chardonay*, from J. Gallegos, Mission San José. Received October 1, 1889, in fair condition. The bunches were very close and some of the berries dried up. The grapes were very ripe, and the must showed 25.0% of solid contents by spindle and 0.45% of acid. The grapes were fermented with No. 1122, Pinot blanc, from Mission San José, in equal proportions. The must reached its maximum temperature on the third day, and was dry on the sixth.

On the seventh day the wine was racked off the thick lees. In six weeks it was clear, of very light color, good aroma, marked flavor, medium acid, full alcohol and body; in general, of very pleasing character. At this date it was racked and taken to the cellar. At four months it was bright and well developed, but was not quite clean-tasting. Two months later it was bright and was racked for the third time. The lees were examined and no unsound germs found. They were examined again at ten and at fifteen months, and only a few acetic germs found. At eighteen months it was bright and of good bouquet and rich flavor, but somewhat injured by too much access of air. At this date the wine was put into glass. At two years and half the wine bottled at six months had deteriorated, while that bottled at eighteen months was bright and of good quality, but not of very high bouquet. A year later the wine had much improved in bouquet.

No. 1375. *Pinot Chardonay*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 17, 1890, in fair condition; a few grapes dried, maturity complete. The must showed 21.3% of solid contents by spindle.

No. 1357. *Pinot Chardonay*, from Mission San José. A sample for must analysis arrived October 14, 1890, in good condition, and mature. The bunches were well filled and the grapes agreed well with Pulliat's description. The must showed 24.8% of solid contents by spindle.

No. 1520. *Pinot Chardonay*, from J. Gallegos, Mission San José. A sample for must analysis arrived October 1, 1890, in good condition, and mature. The must showed 22.75% of solid contents by spindle.

No. 1533. *Pinot Chardonay*, from Paso Robles station. A sample for must analysis arrived October 8, 1891, in poor condition; very small, sunburned, and not properly ripened. The must showed 24.7% of solid contents by spindle.

No. 1622. *Pinot Chardonay*, from Tulare station. A sample for must analysis arrived September 1, 1892, in good condition. The must showed 24.35% of solid contents by spindle.

No. 1735. *Pinot Chardonay*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 25.9% of solid contents by spindle.

No. 1840. *Pinot Chardonay*, from Amador station. A sample for must analysis arrived September 8, 1893, in good condition. The bunches were small, cylindrical, and compact; the berries small, fleshy, tasteless, not quite mature. The must showed 22.4% of solid contents by spindle.

No. 1940. *Pinot Chardonay*, from Tulare station. A sample for must analysis arrived October 13, 1893, in good condition. The bunches were small, short-cylindrical, compact; the berries of medium size, slightly ovoid, flavorless, somewhat sun-dried. The must showed 23.7% of solid contents by spindle.

No. 2093. *Pinot Chardonay*, from J. T. Doyle, Cupertino. A sample for must analysis arrived November 6, 1893, in good condition. The bunches were small, compact, cylindrical, with a small wing or shoulder; the berries small, round, pulpy but soft, very sweet, but very few shriveled. The must showed 25.5% of solid contents by spindle.

SUMMARY OF ANALYSES OF MUSTS AND WINES, WHITE BURGUNDY TYPE.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol by Volume	Total Acid as Tartaric at 6 Months	Body
	Pinot blanc.								
777	Cupertino	1887	30.00	29.83	.50	.60			
845	Cupertino	1888	21.50	22.05	.45	.28	12.09	.51	2.60
1337	Cupertino	1890	25.90		.50				
2027	Cupertino	1893	27.65		.78				
1122	Mission San José	1889	25.90	26.12	.56	.35			
1517	Mission San José	1891	25.10	25.20	.75	.35	13.27	.57	2.10
1593	Los Guilicos	1891	26.80	25.19	.42	.36	14.90	.35	2.20
1621	Tulare	1892	25.20		.39				
1944	Tulare	1893	25.00		.45				
2327	Tulare	1894	26.00		.42				
	Average, Cupertino		**26.26**	**25.94**	**.56**	**.44**	**12.09**	**.51**	**2.60**
	Average, Mission San Jose		**25.50**	**25.66**	**.65**	**.35**	**13.27**	**.57**	**2.10**
	Average, Tulare		**25.40**		**.42**				
	Pinot blanc Chardonay.								
776	Cupertino	1887	25.65		.48	.32	12.09	.57	2.60
849	Cupertino	1888	21.50		.45	.28			
1110	Cupertino	1889	23.50		.41	.29	12.00	.53	2.10
1375	Cupertino	1890	21.30		.70				
2093	Cupertino	1893	25.50		.60				
858	Mission San José	1888	24.24		.48	.39	12.36	.61	2.80
1121	Mission San José	1889	25.00		.45				
1357	Mission San José	1890	24.80		.53				
1520	Mission San José	1891	22.75		.57				
2237	Mission San José	1894	23.70		.50				
1533	Paso Robles	1891	24.70		.30				
1735	Paso Robles	1892	25.90		.43				
1622	Tulare	1892	24.35		.47				
1940	Tulare	1893	23.70		.43	.50			
2326	Tulare	1894	24.80		.35				
1840	Amador station	1893	22.40		.59				
2161	Amador station	1894	26.10		.47				
	Average, Cupertino		**23.49**		**.53**	**.29**	**12.04**	**.55**	**2.35**
	Average, Mission San Jose		**24.09**		**.51**	**.39**	**12.36**	**.61**	**2.80**
	Average, Paso Robles		**25.30**		**.66**				
	Average, Tulare		**24.38**		**.42**	**.50**			
	Average, Amador station		**24.25**		**.53**				

SAUTERNE TYPE.

The attempt to reproduce European types of wines in California has been particularly successful in the case of Sauternes, and there is little doubt that if we could afford to exercise the minute care of some of the wine-makers of the Gironde, some of our products would equal their "premiers crus." It is a well-recognized fact in the Sauternes district that the superiority of the "premiers crus" over the "deuxièmes crus" is due, in most cases, principally to the exercise of greater care and skill, and not to superiority of soil or location. Vineyards which formerly produced wines of second quality, now, by the adoption of better methods, are made to produce wines of first quality. This plainly indicates the direction in which our efforts to improve our Sauternes should tend. Though we will probably never find it profitable to gather the grapes berry by berry, as is done at Château-Iquem, we may very much improve the average quality of our grapes by intelligent pruning and cultivation of the vines. Even the selection of bunches is at present impracticable with the unpracticed pickers who must usually be employed.

One of the most important objects to be kept in view, therefore, is uniformity in the ripening of the grapes. This is almost impossible by the ordinary method of pruning the vines to a head and tying the long canes up to a stake. By this method the grapes on different parts of the vine are exposed to very different conditions of light, heat, and moisture. This is particularly the case with the Sauterne varieties, on account of their heavy foliage and their habit of producing both on the spurs and on the canes. Some method of training, therefore, should be adopted which will place every bunch as nearly as possible under the same conditions of exposure. This is probably most easily and economically obtained by the use of a single wire at about fifteen inches from the soil, to which the vines are tied. The Sauterne varieties lend themselves very readily to this method of training, and the greater regularity of bearing, as well as of ripening, amply repay the extra outlay.

The Semillon, Sauvignon blanc, and Muscadelle are the varieties from which, here as in France, the finest Sauternes are made. For good wines of the second grade a certain proportion of Sauvignon vert is without doubt an improvement on Folle blanche, which is used for this purpose in France.

SEMILLON.

(See Vit. Rept. 1883–85, p. 119; 1885–86, p. 92.)

Synonyms: Colombier; Chevrier; Goulu blanc.

Description.—Rather vigorous; canes semi-erect, vigorous, long, slightly flattened, mahogany colored, and with fairly long internodes; leaves large, thick, three or five lobed; petiolar sinus U-shaped, lower lateral sinuses deep; teeth short, unequal, generally obtuse; upper surface pale green, glabrous, wavy; lower surface slightly downy; bunch large, well filled, conico-cylindrical, winged; berries of good size, nearly round, transparent and of a fine golden color when mature, sweet, thin-skinned, and with a marked and agreeable flavor. The grapes ripen in the second epoch.

The Semillon is perhaps the most famous of the French white grapes, uniting excellence of quality with abundance of production in a more marked degree than any other variety. Mixed with the Sauvignon and the Muscadelle, it produces the highest class Sauternes. The vines have

unfortunately the defect of starting too soon, and thus being exposed to injury by frost; they are also subject to rots, but resist *Peronospora* well. The soil best suited to this variety is a strong, calcareous clay on a gravelly marl subsoil.

This grape has given satisfaction in more localities in California than perhaps any other white variety that has been tried. It is especially valuable in the warmer parts of the coast valleys. It has been planted somewhat extensively in Napa, Sonoma, Santa Clara, and Alameda, proving itself a vigorous grower, shading its grapes well, a reliable bearer, though at times subject to coulure, comparatively free from disease, and easy to graft upon resistant stocks. It has produced satisfactory crops, both with long and with half-long pruning; it is especially adapted to the curved-cane system of pruning, which is practiced in the Sauterne district, where this variety originated. In France it is often pruned short, but with the wide planting usual in California it requires long or half-long canes to yield satisfactory crops. It is reported as yielding from 1½ to 2 tons per acre on light hill soils, and from 4 to 5 tons per acre on rich and valley soils. The average yield for three years at the experimental plot in Santa Clara County was 3.68 tons per acre for the long-pruned and 1.21 tons for the short-pruned vines. At the Fresno and Tulare experimental plots the yield has been very small, not exceeding 1 ton per acre. In San Diego it is reported as a shy bearer.

The must is characterized, in general, by somewhat high sugar contents and low to medium acid; the wine is therefore very apt to retain a little sugar after fermentation, making it very suitable for the production of wines similar to the Sauternes which it produces in France. Notwithstanding its failure to ferment-out quite dry, it is not a difficult wine to handle. With proper care, and without the deplorably excessive use of sulphur fumes in which some wine-makers indulge, it may be brought into perfect condition. The large quantities of sulphurous acid with which some of our otherwise good California wines are impregnated cannot be too strongly deprecated, for it is not only injurious to their quality and wholesomeness, but is also unnecessary. The proof of this is that there are some most excellent California Sauternes on the market, which are quite or very nearly free from any sulphurous taint, showing that, at most, there has been but a very limited and reasonable use of sulphur fumes in their preparation, and that it is therefore possible, by careful handling, to avoid the use of any such excess as is now shown, even by some very prominent brands.

TABLE OF PRODUCTION.

SEMILLON.	Number of Vines.	Total Weight of grapes, in lbs.	Average per Vine, in lbs.	Date of Picking.
1887—No. 745 (long-pruned). J. T. Doyle, Cupertino	20	144	7.2	Oct. 16
No. 750 (long-pruned). J. T. Doyle, Cupertino	20	154	7.7	Oct. 18
No. 753 (short pruned). J. T. Doyle, Cupertino	20	47	2.3	Oct. 19
1888—No. 899 (short-pruned). J. T. Doyle, Cupertino	20	95	4.7	Oct. 8
No. 900 (long-pruned). J. T. Doyle, Cupertino	20	320	16.0	Oct. 8
1889—No. 1131 (half-long-pruned). J. T. Doyle, Cupertino	19	225	11.8	Sept. 29
Row 45 (long-pruned). J. T. Doyle, Cupertino	19	250	13.1	Oct. 2
Row 93 (half-long-pruned). J. T. Doyle, Cupertino	20	175	8.7	Oct. 1

ANALYSES OF MUSTS AND WINES.

SEMILLON.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Volatile Acid	Body	Ash
1883—No. 106.* J. H. Drummond, Glen Ellen						8.48	10.58	.38		1.52	.22
1884—No. 251. Natoma Wine Co., Natoma	Sept. 6	18.83	18.89	.54	.28						
No. 252. Natoma Wine Co., Natoma	Sept. 20	21.69	20.99	.42	.28	9.92	12.36	.45		1.93	18
1885—No. 339. H. Keatinge, Lower Lake		22.89		.55	.32						
No. 434.* J. B. Portal, San José						10.54	13.00	.51		1.80	.17
1886—No. 502. J. T. Doyle, Cupertino		18.40	18.29	.57	.23	7.16	8.93	.69			
1887—No. 745 (long-pruned). J. T. Doyle, Cupertino	Oct. 16	24.89	24.12	.50	.40	10.07	12.54	.52	.14	2.80	
No. 750 (long-pruned). J. T. Doyle, Cupertino	Oct. 18	24.04	22.23	.54	.43	9.12	11.36	.47	.05	2.60	
No. 753 (short-pruned). J. T. Doyle, Cupertino	Oct. 19	25.26	25.53	.44	.45	10.35	12.82	.66	.06	2.10	
1888—No. 899 (short-pruned). J. T. Doyle, Cupertino	Oct. 8	23.54	24.34	.34	.41	9.20	11.45	.54		2.60	
No. 900 (long-pruned). J. T. Doyle, Cupertino	Oct. 8	22.81	22.85	.34	.42	9.05	11.27	.44		2.35	
1889—No. 1015. Margherita Vineyard, Fresno	Aug. 17	26.90	26.99	.31	.60						
No. 1131. J. T. Doyle, Cupertino	Sept. 29	24.10	24.64	.41	.27	10.44	12.91	.44		2.30	
1890—No. 1216. Margherita Vineyard, Fresno	Aug. 23	25.90	24.10	.32	.35						
No. 1329. J. T. Doyle, Cupertino	Oct. 10	23.70		.57							
1891—No. 1556. Paso Robles	Oct. 6	26.90		.38							
1892—No. 1648. Paso Robles	Sept. 13	22.15		.51							
No. 1668. Tulare	Sept. 16	24.00	24.64	.36	.45	10.07	12.54	.59		3.30	
No. 1739. Paso Robles	Oct. 10	25.50		.39							
No. 1657. Amador station	Sept. 16	23.65		.48							
1893—No. 1798. Tulare	Aug. 30	21.50	20.24	.50	.28	7.64	9.50	.50			
No. 1818. Amador station	Sept. 7	20.90	19.89	.63	.28						
No. 2030. J. T. Doyle, Cupertino	Oct. 30	24.55		.60							
1894—No. 2155. Tulare	Sept. 17	25.20		.35							
No. 2158. Amador station	Sept. 19	26.90		.38							

* Wines sent for examination.

RECORD OF TREATMENT.

No. 745. *Semillon*, from J. T. Doyle, Cupertino. Received October 18, 1887, in fair condition. The grapes were from long-pruned vines. Many of the berries were dry or half-dried and some crushed, but none moldy. The bunches were of good size, well shouldered, and with little or no coulure. The must showed 24.89° of solid contents by spindle and 0.50° of acid. The temperature of the grapes at crushing was 75°, and the maximum reached was 89°, on the second day. The fermentation was over on the twelfth day, and the wine was drawn off on the fourteenth.

At two months the wine showed a very pronounced aroma, but less marked than that of No. 750; the acid was very agreeable. A month later it was racked for the second time. At eight months it was pleasant and vinous, had developed some bouquet, was heavy-bodied, and with pleasing but rather low acid. The flavor was exceedingly agreeable, but not so marked as that of No. 750. Two weeks later the lees showed some unsound germs, so the wine was drawn off and pasteurized. At ten months the wine was in good condition, with characteristic and fairly developed bouquet, of medium acid and alcohol; on the whole, very pleasing.

No. 750. *Semillon*, from J. T. Doyle, Cupertino. Received October 19, 1887, in good condition. The grapes were from long-pruned vines of another row than No. 745. The grapes were in good condition, and more highly flavored than those of No. 745. The must showed 24.04° of solid contents by spindle and 0.54° of acid. The temperature of the grapes at crushing was 73°, and the maximum reached was 83°, on the second day. The must was aërated twice on the second and third days, and once on the third and fourth. In six days the wine was nearly dry and clear.

In ten days the wine was drawn off the lees. At two months it was slightly cloudy, with good aroma and medium acid. At three months it was racked for the second time, and at four months racked and pasteurized. At eight months it was bright, with pronounced and characteristic aroma, heavy body, and pleasant acid; wine soft and pleasing, but almost too highly flavored.

No. 753. *Semillon*, from J. T. Doyle, Cupertino. Received October 20, 1887, in good condition. The grapes were from short-pruned vines, and were somewhat larger and less dried-up than the grapes from long-pruned vines; they also showed less coulure and more delicate flavor. The must showed 25.26° of solid contents by spindle and 0.44° of acid. The temperature of the grapes at crushing was 78°, and the maximum reached was 81.5°, on the third day. The fermentation was over on the tenth day.

At two weeks the wine was drawn off the thick lees and taken to the cellar. At two months it was still cloudy, but soft, clean-tasting, and sound; its aroma and flavor were well marked, but more delicate than those of the wines from long-pruned vines. At three months the wine was racked for the second time, and at six months, as the lees showed some unsound ferments, it was racked again and pasteurized. On account of the smallness of the quantity, it was put in glass. At eight months it was bright, with well-developed and characteristic bouquet, somewhat high and sharp acid for Semillon, heavy-bodied, and not quite clean-tasting.

No. 899. *Semillon*, from J. T. Doyle. Cupertino. Received October 10, 1888, in fair condition. The grapes were from short-pruned vines, and showed a great deal of early coulure; some bunches had dried and half-dried berries. The must showed 23.54° of solid contents by spindle and 0.34° of acid. The temperature of the grapes at crushing was 76°, and the maximum reached was 83°, on the third day. Fermentation was over on the twelfth day, when it was drawn off.

At one month the wine was racked off and taken to the cellar. At three months it was clear, of good aroma, medium body; in general, pleasing and sound. Two months later the lees showed some unsound germs, so the wine was drawn off and pasteurized. At eight months it was racked again; it showed more flavor and aroma than No. 900, and had developed well since the last tasting. At sixteen months an examination of the lees showed no unsound germs; the wine was bright and tasted mature, but had developed very little bouquet. A month later it was put into glass. At two years and four months it was bright, clean-tasting, smooth, and agreeable, but without very marked flavor or bouquet. At three years the wine had made some deposit in the bottles, so it was rebottled. Six months later the wine was bright, had made little deposit, showed good bouquet, flavor, body, and alcohol. At four years it was a well-developed, rich wine, of fine character.

No. 900. *Semillon*, from J. T. Doyle, Cupertino. Received October 10, 1888, in good condition. The grapes were from long-pruned vines, and showed less coulure than No. 899, and fewer dried berries. The must showed 22.81% of solid contents by spindle and 0.34% of acid. The temperature of the grapes at crushing was 77°, and the maximum reached was 85°, on the third day. Fermentation was over on the twelfth day, when the wine was drawn off.

At one month the wine was racked and taken to the cellar. At three months it was almost clear, of medium acid, full alcohol, and fair aroma. Two months later a microscopical examination of the lees showed no unsound germs, and the wine was racked for the third time. At ten months it was not quite bright, but showed some bouquet, and agreeable flavor; general quality, smooth and good. At thirteen months the wine was nearly bright; some wine in bottle was clear and sound, but undeveloped. At

sixteen months the microscope showed the lees to be sound; the wine was bright, improved in bouquet and flavor, and nearly mature. It was at this time superior to No. 899, which was in a smaller keg. Two weeks later it was racked again. At twenty-one months the lees showed a few bitter germs, but the wine was bright, of fine amber color, rich bouquet and flavor, clean-tasting, and mature. After this, as the wine was not bottled, it deteriorated.

No. 1015. *Semillon*, from Fresno. A sample for must analysis was received August 20, 1889, perfectly ripe, but in bad condition. The grapes were typical in appearance, but had little of the characteristic flavor of the variety. The must showed 26.9% of solid contents by spindle and 0.31% of acid.

No. 1131. *Semillon*, from J. T. Doyle, Cupertino. Received October 1, 1889, in fair condition. The grapes were typical in appearance and fully ripe, some of the berries being dried. The must showed 24.1% of solid contents by spindle and 0.41% of acid. The grapes were fermented with No. 1134, Sauvignon blanc, from Cupertino. The temperature of the grapes at crushing was 70°, and the maximum reached was 81.5°, on the third day. The wine was dry on the fourth day, and was drawn off. The proportion in which the grapes were mixed was Semillon six sevenths and Sauvignon one seventh.

In two months the wine was clear, of very light color, full and agreeable flavor, but not very marked aroma, clean taste, medium acid, and good body. At this time the wine was racked for the second time and taken to the cellar. Six weeks later the wine was in good condition, of very pleasing flavor, and generally improved and promising. The lees were examined under the microscope, and found to be sound. The lees were examined again at nine and at fifteen months, and no unsound germs found. At eight months the wine was bright, clean-tasting and good, but not very well developed. At fifteen months it had developed some bouquet, and was a wine of high quality. At seventeen months some wine which had been put in glass at seven months was tasted; it was bright and had made no deposit, but it was not as well developed as the wine in wood. At this date the wine was racked again, and some put in bottles. The rest was bottled at twenty months. At two years and five months the wine bottled at seven months showed very full and characteristic flavor and aroma, but was not quite clean-tasting. That bottled at seventeen months was less marked in character, but very smooth and pleasing; the wine bottled later was not quite equal to the latter. A year later the wine bottled at seventeen months retained its high quality, and had changed little.

No. 1216. *Semillon*, from Margherita Vineyard, Fresno. A sample for must analysis arrived August 25, 1890, in somewhat damaged condition, and overripe. The juice showed 25.9% of solid contents by spindle.

No. 1329. *Semillon*, from Cupertino. Arrived October 13, 1890, in fair condition; some dried berries. The sample was for must analysis only; solid contents by spindle, 23.7%.

No. 1556. *Semillon*, from Paso Robles station. Arrived October 8, 1891, in fair condition. The sample was for must analysis only; small bunches of fair-sized berries, a little sunburnt, mature. Solid contents by spindle, 26.9%.

No. 1648. *Semillon*, from Paso Robles station. A sample for must analysis only, arrived September 16, 1892, in good condition. Solid contents by spindle, 22.15%.

No. 1668. *Semillon*, from Tulare station. Arrived September 19, 1892, in good condition. The grapes were crushed the same day, and fermented with No. 1669, Sauvignon Vert, from the same locality. The must showed 24.0% of solid contents by spindle. Fermentation was somewhat slow, but thorough; attained its maximum of 82° on September 23d, and was through September 28th, when the wine was drawn off.

The wine was racked three times during the first year. At three months it was perfectly dry and bright. became slightly cloudy during the spring months, but cleared again and remained sound to the end. The wine was at first smooth and agreeable, of low acid, with some bouquet and flavor; at one year it was not so good, lacking somewhat in freshness and cleanness of after-taste.

No. 1739. *Semillon*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. Solid contents by spindle, 25.5%.

No. 1657. *Semillon*, from Amador station. A sample for must analysis arrived on September 19, 1892, in poor condition. Solid centents by spindle, 23.65%.

No. 1798. *Semillon*, from Tulare station. Received August 31, 1893, in good condition. Bunches of good size and fairly well filled; grapes rather soft and juicy, with little flavor. Must showed 21.5% of solid contents by spindle. Fermentation was quick, but cool, lasting five days and attaining a maximum temperature of 82°. On the sixth day from crushing the wine was drawn off.

The wine was clear, and was racked four weeks after crushing. At four months the wine was bright, with a little bouquet and flavor, fuller acid and fresher taste than most of the Tulare wines. After this it deteriorated, becoming *eventé*, on account of the small size of the keg.

No. 1818. *Semillon*, from Amador station. Received September 8, 1893, in good condition. Berries in small bunches, small, well colored, and of good but not pronounced flavor. Must showed 20.9% of solid contents by spindle.

No. 2030. *Semillon*, from J. T. Doyle, Cupertino. Arrived October 31, 1893, in good condition. Bunches and berries were of medium size; grapes juicy, thin-skinned, highly flavored, and mature. The sample was for must analysis only; solid contents by spindle, 24.55%.

SAUVIGNON BLANC.

(See Vit. Rept. 1883–85, p. 120.)

Synonyms: Sauvignon jaune; Blanc Fumé.

The Sauvignon is more widely distributed than the Semillon, as it forms not only an important ingredient of the wines of the Sauterne type in the Gironde, but is also well known southward to the Pyrenees, northward to the Loire, and eastward to the Rhone. Being only of fair vigor and rather a shy bearer, but of high quality, it is chiefly used in blending with both red and white wines of other varieties, to which it imparts its fine and delicate flavor, while at the same time losing the slight harshness that characterizes its wines during the first years. The Sauvignon is pruned short in the Sauterne district, and this should be done wherever the soil is not rich, as otherwise the vine will be too soon exhausted. It ripens somewhat after the middle of the season. At Natoma the grapes were gathered fairly ripe on September 6th, fully ripe on September 17th, with the Semillon, and overripe on September 30th.

Description.—Vine less vigorous than the Semillon, and with smaller canes; leaves medium to small, round, generally three-lobed, with closed sinuses, glabrous and dark green above and with a flocculent down below; bunches small, conico-cylindrical, close; berries of medium size, slightly oval, on slender pedicels, juicy, with thick but tender skin, and very aromatic flavor.

The Sauvignon has shown that it retains its distinctive and high quality at least in the coast counties of California, but its bearing has been deficient. It has not shown itself to be as well adapted to our conditions as the Semillon, and should only be planted in small quantity to give character to more neutral grapes. In the rich soils of the interior valleys it loses a great part of its character. It is pruned short in the Sauterne district, but seems to need long canes in California. The grapes ripen later than those of the Riesling and earlier than those of the Sauvignon vert; they easily and constantly attain a full percentage of sugar, and maintain their acid well, even in the San Joaquin Valley.

ANALYSES OF MUSTS AND WINES.

SAUVIGNON BLANC.	Date of Picking	MUST.				WINE.				
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Volatile Acid	Body
1884—No. 253. Natoma Wine Company, Natoma		21.66	21.22	.62	.31	10.26	12.75	.55	.19	2.18
No. 254. Natoma Wine Company, Natoma		22.20	20.99	.53	.29	9.92	12.36	.45	.16	2.10
1885—No. 335. H. Keatinge, Lower Lake		24.20	-----	.59	-----	-----	-----	-----	-----	-----
1889—No. 1032. Margherita Vineyard, Fresno	Aug. 30	23.76	23.61	.79	.60	-----	-----	-----	-----	-----
No. 1134.* J. T. Doyle, Cupertino	Oct. 2	26.10	26.12	.58	.37	-----	-----	-----	-----	-----
1890—No. 1317. J. T. Doyle, Cupertino	Oct. 10	25.00	-----	.58	.20	12.39	15.20	.48	-----	2.12
1891—No. 1464. Fresno	Aug. 28	23.50	-----	.76	.46	8.84	11.00	.53	-----	2.74
1894—No. 2325. Tulare	Oct. 15	24.50	-----	.35	-----	-----	-----	-----	-----	-----

*Fermented with No. 1131, Semillon.

RECORD OF TREATMENT.

No. 1032. *Sauvignon blanc*, from Margherita Vineyard, Fresno. A sample for must analysis was received September 2, 1889, in fair condition. The grapes, which were very ripe, were of typical appearance, but lacked the characteristic flavor of the variety. The must showed 23.76% of solid contents by spindle and 0.79% of acid.

No. 1134. *Sauvignon blanc*, from J. T. Doyle, Cupertino. Received October 3, 1889, in good condition, and mature. The bunches were small, cylindrical, and rather compact; the berries from small to average, slightly oval, with rather thick but tender skin, green, and covered with brownish spots; flesh tender and juicy, and with very marked flavor. The must showed 26.1% of solid contents by spindle and 0.58% of acid. The grapes were fermented with No. 1131, Semillon.

No. 1317. *Sauvignon blanc*, from J. T. Doyle, Cupertino. Received October 13, 1890, in rather poor condition. The must showed 25.0% of solid contents by spindle and 0.58% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 80°, on the fourth day. The wine was drawn off the thick lees on the seventh day.

At three weeks the wine was still cloudy. At six weeks it was quite clear, had good aroma, full and pleasing flavor, medium acid, good body, and was generally of good quality. At four months the wine was racked for the second time. Examinations of the lees at six weeks and at three months showed no bad germs. At five months a few acetic germs were seen, but two months later the lees were quite sound. At six months the wine was bright, sound, and maturing well. At fifteen months it was in good order, showed full, rich bouquet and flavor, and was very characteristic, well matured, and of high quality. At seventeen months it was racked and part put in bottle; at twenty-two months the rest was bottled. At three years both bottlings were bright and had thrown no deposit. They both showed good bouquet and full, rich flavor; that bottled later was smoother and cleaner-tasting than the other, but deeper in color.

No. 1464. *Sauvignon blanc*, from Fresno. Received August 31, 1891, in fair condition. The must showed 23.5% of solid contents by spindle and 0.76% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 82°, on the third day. On the fifth day the wine was dry, and was drawn off the thick lees.

In two weeks the wine was nearly clear. At six weeks it was bright, showed some aroma, good flavor, clean taste, and good acid. At two months it was racked and taken to the cellar. At four months it was in good order, and showed good bouquet and flavor. The lees were examined microscopically at four and at seven months, and found to be sound. At seven months the wine was bright, sound, and pleasing; it was nearly mature, and at nine months it was bottled. The wine remained clear in the bottle, but became flat, owing partly to the smallness of the quantity made.

SAUVIGNON VERT.

(See Vit. Rept. 1885-86, p. 92.)

Synonyms: Green Riesling (Napa); Colombar (in California); Colombaud (?).

There is some doubt about the identity of the Sauvignon vert. In this State it is commonly called the Colombar, which is a mere corruption of Colombaud, a well-known French variety. The following description of the Colombaud is taken from Foëx: "Vine very vigorous; canes erect, thick, with medium internodes; leaves of average size, the petiolar sinus deep and almost closed, lateral sinus shallow, teeth sharp and in two series, the upper surface glabrous and almost shining, the lower surface slightly downy; bunch of average size, somewhat irregular, winged, and close; berries large, spherical, transparent, of a greenish-white, becoming yellow and a little rusty on the side exposed to the sun, thin-skinned, and agreeable to eat; they ripen somewhat late."

This description serves very well in most essentials for the Sauvignon vert as grown in California, though the form of the leaf is not quite as described. The Colombaud is, like most of the white vines of Provence, very hardy; it grows well, even in soils the least favorable to the vine. On account of its thin skin it rots easily in damp places, and it is subject to coulure in poor soils. It is best suited to rich, warm, well-drained soils. On account of its vigor, it resisted the phylloxera longer than almost any other variety in the south of France.

In California the Sauvignon vert has shown itself a very good bearer almost everywhere, except on heavy clay soils, where it is apt (especially if pruned short) to develop too much foliage and to be injured by *oidium*. Like the Semillon, it is at home in the hill soils of the coast valleys, where it gives large crops, which ripen well and develop high sugar with comparatively low acid. It gives a wine of high flavor and aroma, but not particularly robust, and which, unless blended, is difficult to keep. In Tulare and Fresno, on the contrary, it retains for the locality a relatively good amount of acid at maturity, and produces a wine of considerable merit with regard to quality, but as usual difficult to keep when pure.

Its bearing at Tulare has not been very satisfactory, being below two tons per acre. It might be used in that locality as a blend with neutral wines, on account of its marked flavor, but there are others more satisfactory for that purpose. When grown on well-drained, light soils, it produces an excellent wine of the Sauterne type, but when grown on richer soils the wine produced is lacking in keeping qualities. When grown under the conditions where it gives the best results, it produces an average of from three to five tons per acre. It has been noted by Mr. F. Swett, of Martinez, Contra Costa County, that this variety has the valuable quality of bearing grapes on canes from adventitious buds, thus insuring a crop even after the first growth of canes has been destroyed by frost. At the Paso Robles experiment station this variety has uniformly produced grapes with a particularly low percentage of acid, and is, therefore, not to be recommended for that locality as a grape for dry wines.

SAUVIGNON VERT.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric, at Six to Eight Months	WINE. Volatile Acid	WINE. Body
1886—No. 490. J. T. Doyle, Cupertino		18.70	18.71	.42	.26	7.09	8.85	.53		1.75
1887—No. 697 (long-pruned). J. T. Doyle, Cupertino	Oct. 5	23.01	23.23	.39	.34	9.63	12.00	.75	.12	2.20
No. 708 (short-pruned). J. T. Doyle, Cupertino	Oct. 10	25.67	26.00	.47	.54	11.00	13.45	.44		2.60
No. 724. J. P. Smith, Livermore	Oct. 12	22.67	22.67	.30	.42	9.49	11.82	.47	.09	2.60
1888—No. 880 (short-pruned). J. T. Doyle, Cupertino	Oct. 3	21.39	21.38	.28	.40	7.92	9.90	.45		2 33
No. 881 (long-pruned). J. T. Doyle, Cupertino	Oct. 3	21.55	22.23	.27	.24					
1889—No. 1018. Margherita Vineyard, Fresno	Sept. 1	24.50	25.19	.46	.66					
No. 1095. Margherita Vineyard, Fresno	Sept. 18	21.50	21.38	.58	.48	8.84	11.00	.47		2.70
No. 1130. J. T. Doyle, Cupertino	Oct. 1	23.30	22.95	.38	.39	9.56	11.91	.40		2.40
1890—No. 1220. Margherita Vineyard, Fresno	Aug. 23	23.70	23.61	.47	.45					
No. 1275. J. T. Doyle, Cupertino	Sept. 30	19.30		.51	.24	8.20	10.25	.42		2.20
1891—No. 1433. Tulare	Aug. 25	20.85		.30	.61					
No. 1455. Fresno	Aug. 27	21.50		.68		8.91	11.09	.49		2.60
No. 1513. Calistoga	Sept. 27	24.25	21.38	.53	.35	10.54	13.09	.53		2.20
No. 1514. Asti, Sonoma County	Sept. 28	22.70	21.38	.44	.30	9.20	11.45	.53		2.55
No. 1540. Paso Robles	Oct. 6	25.55		.22						
1892—No. 1669. Tulare	Sept. 16	25.45	25.53	.37	.49					
No. 1733. Paso Robles	Oct. 10	23.70		.35						
1893—No. 1821. Amador station	Sept. 6	22.60	21.38	.59	.21					
No. 1847. Tulare	Sept. 13	23.70	21.80	.54	.51	9.20	11.45	.44		2.60
No. 1961. Paso Robles	Oct. 12	29.30		.32						
No. 2091. Cupertino	Nov. 5	24.10		.61						
1894—No. 2157. Amador station	Sept. 19	26.90		.38						
No. 2218. Paso Robles	Sept. 28	25.65		.30						
No. 2287. Tulare	Oct. 6	26.90	25.19	.38		10.35	12.82	.41		2.30

RECORD OF TREATMENT.

No. 697. *Sauvignon vert*, from J. T. Doyle, Cupertino. Received October 6, 1887, in good condition. The grapes were from long-pruned vines, and showed some coulure. Both bunches and berries were large, the latter very sweet and thin-skinned. The must showed 23.01% of solid contents by spindle and 0.39% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 89°, on the fourth day. The fermentation was over on the tenth day. At twelve days the wine was drawn off the thick lees.

At two months the wine was bright, with little aroma, medium acid, pleasant, smooth, and full-bodied. Five months later the lees showed some unsound germs, so the wine was drawn off and pasteurized. Six weeks after pasteurizing it was a bright, fine-flavored, and good wine, with pronounced bouquet, but rather sharp acid.

No. 708. *Sauvignon vert*, from J. T. Doyle, Cupertino. Received October 11, 1887, in good condition. The grapes were from short-pruned vines, and showed very little coulure. The bunches were large and full, contrasting favorably with those from the long-pruned vines; the berries were smaller, on the average, in the latter lot. The must showed 25.67% of solid contents by spindle and 0.47% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 81°, on the third day. In six days the fermentation was over.

At three weeks the wine was drawn off the lees. At two months it was still cloudy, but tasted sound; had light, pleasant acid and fair aroma. A microscopic examination of the lees showed no unsound germs. At three months the wine was racked again, and at eight months it was almost bright; it had developed some bouquet, and would have been a good wine but that it was not quite clean-tasting.

No. 724. *Sauvignon vert*, from J. P. Smith, Livermore. Received October 13, 1887, in good condition, although somewhat crushed in transit. The bunches were large and heavily shouldered, but showed some coulure. The berries were somewhat smaller than those of the same variety from Cupertino; they were very juicy, thin-skinned, and sweet. The must showed 22.67% of solid contents by spindle and 0.30% of acid. The temperature of the grapes at crushing was 69.5°, and the maximum reached was 85°, on the third day. In two weeks the fermentation was over. At eighteen days the wine was drawn off the lees.

At two months it was still cloudy, but sound and agreeable. At three months it was racked again. At five months it was racked for the third time and pasteurized. At eight months it was bright and sound; it showed moderate acid, heavy body, and some bouquet—altogether, a wine of very good quality.

Nos. 880 and 881. *Sauvignon vert*, from J. T. Doyle, Cupertino. Received October 5, 1888, in good condition. No. 880 was from short-pruned and No. 881 from long-pruned vines. The grapes from the long-pruned vines showed the most coulure. The must showed 21.39% of solid contents by spindle and 0.28% of acid for the short-pruned; and 21.55% of solid contents by spindle and 0.27% of acid for the long-pruned. The grapes were crushed and fermented together. The maximum temperature, reached the third day, was 86.5°, and the time of fermentation eleven days.

At one month the wine was racked and taken to the cellar. At three months it was clear and of good flavor and aroma; but as the lees were not quite right, the wine was pasteurized. Three months after pasteurizing it was racked and part put in bottle. At ten months it was bright, of light golden color, marked and agreeable flavor, medium acid, good body; rather astringent for a white wine, general quality good. At fourteen months the wine put in bottle at six months was perfectly sound, of agreeable character, and well developed. At sixteen months the lees were sound and the wine was in good order, of good bouquet and advanced development. A month later it was racked again, and a part bottled. At twenty-two months the rest of the wine was bottled; it was bright, smooth, and agreeable, with low acid; the lees were sound. At twenty-eight months the wine bottled at six months was clear, clean-tasting, and of good quality, except for the odor, which was not pleasing; that bottled at seventeen months had less flavor than the above; that bottled at twenty-two months was the only one that had made no deposit in the bottle, but it had less character than the others. At three years and ten months the wine bottled at seventeen months was much the best of the three; it was a wine of high quality, full flavor, and rich bouquet; it had deposited a slight but well-settled deposit.

No. 1018. *Sauvignon vert*, from Fresno. A sample for must analysis was received September 2, 1889, in fair condition. The grapes were overripe, and showed little of the characteristic flavor of the variety. The must showed 24.5% of solid contents by spindle and 0.46% of acid.

No. 1095. *Sauvignon vert*, from Fresno. Received September 20, 1889, in good condition. The grapes came from the Margherita Vineyard, and were less ripe than those from the experimental plot. The bunches were of medium size, cylindrical, and winged; the berries round, loose, soft, and juicy, of agreeable but not marked flavor, and with green, thin, but rather resistant skin. The must showed 21.5% of solid contents by spindle and 0.58% of acid. In five days the wine was nearly dry, the highest temperature of 82.5° being reached on the third day.

On the fifth day the wine was racked off, but left in the fermenting-room, as it was not quite dry. At one month it was still cloudy, but tasted sound, though somewhat insipid. At two months it was racked again and taken to the cellar. At four months the wine was still cloudy, insipid, and of poor quality, but without any very bad taste. The lees, however, showed some germs of unsoundness, and two months later, as the flavor was becoming affected, the wine was pasteurized. At nine months the wine was bright and much improved, but neither the odor nor the taste was quite clean. Two months later it was still in good condition, but was a wine of poor quality. After this it deteriorated.

No. 1130. *Sauvignon vert*, from J. T. Doyle, Cupertino. Received October 3, 1889, in good condition. The bunches were large and rather loose, well shouldered; berries unequal, but in general over-average, soft and very juicy, and with characteristic flavor. The must showed 23.3% of solid contents by spindle and 0.38% of acid.

At six weeks, when the wine was racked for the second time and taken to the cellar, it was nearly clear, of marked flavor and aroma, medium acid, good body, and clean taste. Two months later it was clear, smooth, and agreeable. At this time the lees showed a few unsound germs, and four months later the number had increased and the flavor was beginning to be affected, so the wine was pasteurized. A month after pasteurizing the wine was clear, and but little changed since the last tasting. Two months later it was bright, with good, full bouquet and flavor, clean taste, and in general much improved. At fifteen months it was bright and of good bouquet and flavor, but tasted a little exhausted. At eighteen months the wine bottled at ten months was tasted; it was sound and bright, and fresher and better than the wine in the keg. At this time the rest of the wine was bottled. At two years and five months both samples tasted somewhat thin. A year later the second bottling was smooth, full-bodied, and agreeable, but was lacking in bouquet.

No. 1220. *Sauvignon vert*, from Margherita Vineyard, Fresno. A sample for must analysis was received August 25, 1890, in good condition, but overripe. The must showed 23.7% of solid contents by spindle.

No. 1275. *Sauvignon vert*, from J. T. Doyle, Cupertino. Received October 2, 1890. Bunches and berries large; grapes juicy, wet from the rain, and slightly moldy. Must showed 19.3% of solid contents by spindle. The fermentation was cool and somewhat prolonged, attained a maximum temperature of 79° on the fourth day, and was nearly through eight days after crushing.

The wine was racked twice before the end of the year, cleared well, and developed some bouquet and flavor. At the end of January the lees showed a few unsound germs, and the wine was pasteurized for safety. The wine developed fairly well, acquired a good bouquet, but was somewhat deficient in flavor. At fourteen months the wine tasted mature, and some of it was bottled; at twenty-four months the rest was bottled. One year after bottling the wine was bright and in good order, but that last bottled was a little exhausted.

No. 1433. *Sauvignon vert*, from Tulare station. Received August 27, 1891, in good condition. A sample for must analysis showed 20.85% of solid contents by spindle.

No. 1455. *Sauvignon vert*, from Fresno. Received August 31, 1891, in good condition. The must showed 21.5% of solid contents by spindle. Fermentation lasted six days, attaining a maximum temperature of 80° on the fifth day.

The wine was racked at one and at four months from crushing; cleared rather slowly, but remained sound and developed some bouquet. At eight months the wine was not quite clear, showed some lactic germs in the lees, and did not taste quite clean; it was racked into a sulphured keg, and two months later was racked again. At two years the wine was bright and sound, but with little flavor and a slight taste of sulphur.

No. 1513. *Sauvignon vert*, from P. R. Schmidt, Calistoga. Received September 29, 1891, in good condition, and mature. The must showed 24.25% of solid contents by spindle. Fermentation was very slow and cool, and the wine was not dry till about one month after crushing.

The wine was clear at two months, and was racked at three months for the second time; it had high acid and was at first very harsh, but at five months the bouquet had developed remarkably. At fifteen months it was a fresh and pleasing wine, in first-rate condition, and mature, and was bottled.

No. 1514. *Sauvignon vert*, from Asti, Sonoma County. Received October 1, 1891, in poor condition—crushed and a little moldy. The grapes had none of the flavor of Sauvignon vert, and more resembled Orleans Riesling. The must showed 22.70% of solid contents by spindle. Fermentation was at its height on the fourth day, with a temperature of 77°, and was finished on the eighth day.

The wine was racked twice during the first three months; it cleared well, and gave promise of being a good wine. At five months it was bright, with rich bouquet and flavor, but somewhat raw. At fifteen months it had toned down, was mature, and of high quality. At sixteen months it was bottled.

No. 1540. *Sauvignon vert*, from Paso Robles station. A sample for must analysis was received October 8, 1891, in good condition; grapes mature, but sunburned. The must showed 25.55% of solid contents by spindle.

No. 1669. *Sauvignon vert*, from Tulare station. Received September 19, 1892, in good condition. The must showed 25.45% of solid contents by spindle. For fermentation record, see No. 1668, Semillon.

No. 1773. *Sauvignon vert*, from Paso Robles station. Sample for must analysis was received October 13, 1892, in good condition. The must showed 23.7% of solid contents by spindle.

No. 1821. *Sauvignon vert*, from Amador station. Received September 8, 1893. Fine, juicy grapes, but without much flavor. The must showed 22.6% of solid contents by spindle. The fermentation was very slow and protracted, and the wine was not in sufficient quantity to keep.

No. 1847. *Sauvignon vert*, from Tulare station. Received September 15, 1893. Bunches loose, but well filled, and of average size; the berries were of average size, mature, and well flavored. The must showed 23.7% of solid contents by spindle. The fermentation was prompt and thorough, attaining a maximum temperature of 83° on the second day, and finishing on the sixth day.

The wine cleared rapidly, and at three months, having been racked twice, was bright. At four months it showed marked bouquet and flavor, a slight bitterness, and more character than most of the Tulare wines. At seven months it still showed good qualities, but was not perfectly clean-tasting and fresh.

No. 1961. *Sauvignon vert*, from Paso Robles station. A sample for must analysis was received October 14, 1893, in fair condition. Bunches were of medium size, and winged; berries thin-skinned, juicy, highly flavored, and mature. The must showed 29.3% of solid contents by spindle.

No. 2091. *Sauvignon vert*, from J. T. Doyle, Cupertino. A sample for must analysis was received November 6, 1893, in good condition. Bunches large, shouldered, a little coulured above; berries of medium size, soft, juicy, mature. The must showed 24.1% of solid contents by spindle.

FOLLE BLANCHE.

(See Vit. Rept. 1883–85, p. 124; 1885–86, p. 93.)

Synonyms: Enrageat; Plant de Dame; Grosse Chalosse; Grais; Rebauche in the southwest of France, and Piquepouille in the Department of Gers.

The Folle blanche is too well known at this time in its capacity of a brandy grape, and its wine as a blend for Bordeaux Clarets, to require more than a passing notice here. As a prolific bearer it has attracted considerable attention, but it should not be forgotten that the use of its wine for blending is practically limited by the amount of blendable red wines—that is, wines having sufficient character and color to stand the dilution of these qualities without the addition of something more definite than is supplied by the Folle blanche. The inverse ratio between quality and quantity cannot be too fully remembered, and unless the practice of reducing all wines to a common level, and paying so much per gallon of "wine" to the producer, be supposed to be perpetuated, the world's habit of paying mainly for high quality in wines must be conformed to. It seems predicable of the Folle blanche that it will yield a better quality of blending wine on valley land than either the Sultana or Burger, in the more northern regions of California.

Description.—Trunk short and thick; canes short, thick, of a reddish color, with internodes of medium length; leaves of medium size, five-lobed, petiolar sinus very slightly open, lateral sinus deep and open, teeth short and obtuse, superior surface deep green, glabrous, slightly puckered, the red veins of the inferior surface slightly pubescent; bunch large, compact, cylindrical or conico-cylindrical; berries large, spherical, of a whitish-green, acquiring a golden hue on the side exposed to the sun, skin thick, resistant, juicy, and sweet. Ripens about the second period of Pulliat.

The Folle blanche is the variety *par excellence* of the Charentes or Cognac region of France, where it constitutes nine tenths of the vines

grown there. Its wine is very acid, and has little value for direct consumption, being all made into brandy. It is valuable, however, as a blend with the highly colored wines of the "Midi," communicating to them a pleasing freshness and remarkable brilliancy. This is especially true with regard to the Jaquez or Lenoir. It is planted also in considerable quantities in the "Graves" region with the high class of grapes of this type for the production of inferior Sauternes. It adapts itself to all kinds of rich soils. It is subject to spring frosts, and rots easily in wet years.

Wherever the Folle blanche has been tried in California it has usually supported its European reputation as a heavy bearer. Its average for three years at Cupertino was 4.6 tons per acre; about Stockton it gives good crops, but at Tulare the yield has been small. It yields a must characterized in general by low sugar and high acid, and is useful as a blend with certain red grapes to reduce their harshness and to aid their fermentation. From Livermore it is reported as making a good wine, but, in general, it is found to yield only a neutral wine of little character, good for certain blends, and, as in France, particularly suited for the production of brandy. At Tulare it produces an agreeable wine, which matures quickly and must be used young, as it soon deteriorates.

TABLE OF PRODUCTION.

FOLLE BLANCHE.	Number of Vines	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking
1887—No. 762 (long-pruned). J. T. Doyle, Cupertino	20	282	14.1	Oct. 20
No. 763 (short-pruned). J. T. Doyle, Cupertino	20	40	2.0	Oct. 20
1888—No. 937 (short-pruned). J. T. Doyle, Cupertino	20	295	14.7	Oct. 23
No. 938 (long-pruned). J. T. Doyle, Cupertino	20	465	23.2	Oct. 23
1889—No. 1167 (short-pruned). J. T. Doyle, Cupertino	19	300	15.2	Oct. 11
Row 82 (short-pruned). J. T. Doyle, Cupertino	20	200	10.0	Oct. 23

FOLLE BLANCHE.	Date of Picking.	MUST.				WINE.					
		Solid Contents by Spindle.	Sugar Test by Copper.	Acid as Tartaric.	Ash.	Alcohol.		Total Acid as Tartaric, at Six to Eight Months.	Volatile Acid.	Body.	Ash.
						By Weight.	By Volume.				
1884—No. 258. Natoma Wine Company, Natoma		22.10	21.97	.66	.27	9.92	12.36	.59		1.66	.21
No. 259. J. L. Black, Livermore		18.00		.47		7.43	8.75	.57		1.80	.24
No. 259*a*. Fresno		20.70	20.17	.59	.23						
1886—No. 515. J. T. Doyle, Cupertino		20.00	19.96	.47	.39	6.55	8.23	.69		1.80	
No. 574 (condensed must). J. D. Cone, Sacramento		23.70	24.12	.48	.36						
1887—No. 762 (long-pruned). J. T. Doyle, Cupertino	Oct. 20	23.23	22.23	.71	.35	8.91	11.09	.61	.10	2.20	
No. 763 (short-pruned). J. T. Doyle, Cupertino	Oct. 20	25.14	24.64	.58	.37	10.54	13.00	.50		2.60	
1888—No. 937 (short-pruned). J. T. Doyle, Cupertino	Oct. 23	21.89	22.67	.51	.30	8.48	10.58	.54		2.05	
No. 938 (long-pruned). J. T. Doyle, Cupertino	Oct. 23	21.41	21.80	.68	.26						
1889—No. 1167. J. T. Doyle, Cupertino	Oct. 11	21.95	22.22	.54	.29	8.91	11.09	.44		1.95	
No. 1183. J. Gallegos, Mission San José	Oct. 15	22.60		.44							
1890—No. 1272. J. T. Doyle, Cupertino	Sept. 29	18.15		.76	.24	7.09	8.85	.53		2.44	
No. 1421. J. Gallegos, Mission San José	Oct. 29	26.10		.71							
1891—No. 1452. Tulare	Aug. 26	18.60		.61							
No. 1482. Fresno	Sept. 7	20.65	20.00	.46	.54	8.48	10.58	.38		2.34	
No. 1534. Paso Robles	Oct. 6	18.10		.70							
1892—No. 1672. Tulare	Sept. 16	23.80	23.13	.45	.45	9.20	11.45	.44		2.70	
No. 1752. Paso Robles	Oct. 11	19.85		.60							
1893—No. 1837. Amador station	Sept. 5	19.30		.92							
No. 1860. Amador station	Sept. 12	19.30		.90							
No. 1909. Tulare	Oct. 3	21.50	20.61	.68	.42	8.13	10.17	.59		2.10	
No. 1992. Mission San José	Oct. 19	21.50		.53							
No. 2020. Mission San José	Oct. 27	20.50	19.82	.80	.23	8.27	10.36	.77		2.20	
No. 2032. J. T. Doyle, Cupertino	Oct. 31	23.05		.77							
1894—No. 2244. Mission San José	Oct 5	20.00		.49							
No. 2297. Mission San José	Oct. 12	19.40		.71							
No. 2329. Tulare	Oct. 15	22.60		.45							

RECORD OF TREATMENT.

No. 762. *Folle blanche*, from J. T. Doyle, Cupertino. Received October 21, 1887, in very good condition. The grapes were from long-pruned vines, and showed very little coulure or dried berries. The berries were, on the average, of medium size, but very uneven. The must showed 23.23% of solid contents by spindle and 0.71% of acid. The temperature of the grapes at crushing was 73°, and the maximum reached was 81°, on the third day. The fermentation was over on the fifth day.

At three weeks the wine was drawn off the thick lees. At two months it was clear, with light aroma and full acid; it was sound, but thin. Four months later it was racked again, and pasteurized. At eight months it was bright, and developed a good aroma, and was agreeable, but of rather sharp acidity.

No. 763. *Folle blanche*, from J. T. Doyle, Cupertino. Received October 21, 1887, in good condition. The grapes were from short-pruned vines, and showed more coulure and dried berries than those from the long-pruned vines. The sound berries were, however, larger and sweeter. The must showed 25.14% of solid contents by spindle and 0.58% of acid. The temperature of the grapes at crushing was 73°, and the maximum reached was 80°, on the third day. In eight days the fermentation was over.

At two weeks the wine was drawn off the lees. At two months the wine was light and neutral, with some aroma and pleasant acid. At eight months it was almost bright, well developed, of good body, pleasing acid, and some bouquet.

Nos. 937 and 938. *Folle blanche*, from J. T. Doyle, Cupertino. Received October 24, 1888, in fair condition. The must showed 21.89% of solid contents by spindle and 0.51% of acid in No. 937, and 21.41% of solid contents by spindle and 0.68% of acid in No. 938. The temperature of the grapes at crushing was 71°, and the maximum reached was 85°, on the fourth day. In twelve days the fermentation was over.

At six weeks the wine was racked and taken to the cellar. A month later it was nearly clear and of fair quality, but the lees showed faint traces of unsound germs, so the wine was pasteurized. At six months it was racked again, and at ten months it was clear, well developed, and agreeable. Four months later it showed some improvement. At sixteen months the lees were examined, and no unsound germs found; the wine was bright, with good flavor and well-developed bouquet—altogether a good wine, and mature. A month later it was racked and a part put in bottle. At twenty-one months the wine was in good order, somewhat thin, but of good flavor and bouquet. At twenty-two months it was bottled. At two years and five months the wine first bottled was clear and had made no deposit; it showed good bouquet and flavor, but was not quite clean-tasting. That bottled later was cleaner-tasting, but had less flavor. Eighteen months later the second bottling was still the better.

No. 1167. *Folle blanche*, from J. T. Doyle, Cupertino. Received October 15, 1889, in bad condition, many of the grapes being moldy. The must showed 21.95% of solid contents by spindle and 0.54% of acid. The maximum temperature reached was 82°, and the fermentation was over on the sixth day. In two months the wine was clear, of very light color, faint but agreeable aroma, clean-tasting, of medium body and full acidity, and, in general, rather good. A month later it was bright and well developed, but neutral. The lees were sound, but at seven months they showed some bitter ferments, and, though the taste was unaffected, the wine was pasteurized for safety. A month after pasteurizing the wine was bright, of delicate bouquet, good flavor, full and pleasing acid, and advanced development. The lees, which were examined twice after this, remained sound. At fifteen months the wine was in good condition—smooth, pleasing, and mature. Two months later it was racked, and at twenty-two months bottled. At two years and five months the wine was bright, very smooth, and pleasing, with little character, but no positive defects. A year later it had retained its good qualities, and had made a very little deposit in the bottle.

No. 1183. *Folle blanche*, from Mission San José. A sample for must analysis was received October 16, 1889, in fair condition, and mature; soft, juicy grapes, with somewhat thick and tough skin and insipid taste. The must showed 22.6% of solid contents by spindle.

No. 1272. *Folle blanche*, from J. T. Doyle, Cupertino. Received October 2, 1890, in bad condition—much bruised and with many moldy and rotten bunches. The grapes, which were not mature, were carefully picked over and fermented. The must showed 18.15% of solid contents by spindle. The fermentation lasted a week, and reached a maximum temperature of 80° on the fourth day.

The wine was slow in clearing, but at two months was clear, light, highly acid, clean-tasting, but lacking in bouquet and flavor. At three months the wine was much improved, having acquired some bouquet. At five months the wine showed some unsound germs in the lees, and was therefore pasteurized. The wine was green, but continued improving until it was fifteen months old, when part of it was bottled; the rest was bottled five months later. Fourteen months after bottling the wine was bright, of fair quality, lacking in bouquet, but of good flavor. That bottled later was somewhat exhausted, and inferior to the others.

No. 1421. *Folle blanche*, from J. Gallegos, Mission San José. A sample, for must analysis only, arrived October 31, 1890. The must showed 26.1% of solid contents by spindle.

No. 1452. *Folle blanche*, from Tulare station. A sample for must analysis was received August 29, 1891, in good condition, but not mature. The must showed 18.6% of solid contents by spindle.

No. 1482. *Folle blanche*, from H. Eggers, Fresno. Received September 9, 1891, somewhat injured from loose packing and a little moldy, not quite mature. The must, which showed 20.65% of solid contents by spindle, fermented through in six days.

The wine was at first slow in clearing, green, and without bouquet, but well flavored, smooth, and agreeable. It was racked twice during the first three months, and three times afterward; it remained green-tasting, but improved, and at six months was a light, neutral, fairly agreeable wine. After that it deteriorated somewhat. At eighteen months it was bottled, and but for a somewhat disagreeable odor was a fair wine.

No. 1534. *Folle blanche*, from Paso Robles station. A sample for must analysis was received October 8, 1891, in good condition, but not quite mature. Bunches were medium-sized, very compact, with small berries. The must showed 18.10% of solid contents by spindle.

No. 1672. *Folle blanche*, from Tulare station. Received September 19, 1892; a little crushed, but fresh. The must showed 23.8% of solid contents by spindle; it fermented well, attaining the maximum temperature of 80° on the third day after crushing.

The wine was racked twice during the first three months, cleared well, and as a young wine was very promising. At seven months it was at its best, in good condition, smooth and of good body, but lacking in flavor and bouquet. At fourteen months it was bright and sound, but a little flat and lacking in "finesse."

No. 1752. *Folle blanche*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. Solid contents by spindle, 19.85%.

No. 1837. *Folle blanche*, from Amador station. A sample for must analysis was received September 8, 1893, in good condition. Bunches and berries medium-sized; grapes not mature. The must showed 19.3% of solid contents by spindle.

No. 1860. *Folle blanche*, from Amador station. Received September 15, 1893, in good condition. The same as No. 1837, showing about the same degree of maturity.

No. 1909. *Folle blanche*, from Tulare station. Received October 5, 1893, in good condition. Large, juicy berries, in medium-sized bunches, mature, but with little flavor. The must showed 21.5% of solid contents by spindle. The fermentation was prompt and thorough, attaining its maximum, with a temperature of 82°, on the third day, and finishing on the third day.

The wine cleared rapidly, and was racked twice during the first month. At three months it was bright, had a little bouquet, some flavor, and good acid. At six months it had not changed much, but was a fairly fresh-tasting wine, without much character.

No. 1992. *Folle blanche*, from Mission San José. A sample for must analysis was received October 19, 1893, in good condition. The grapes were medium-sized, fleshy, thin-skinned, and quite mature. The must showed 21.5% of solid contents by spindle.

No. 2020. *Folle blanche*, from Mission San José. Received October 27, 1893, in poor condition—crushed, and with some mold. The must showed 20.5% of solid contents by spindle. The fermentation was slow and cool, and three weeks after crushing the wine contained a little sugar.

At three months the wine was bright, dry, and clean-tasting, with little bouquet, but distinctive flavor and full acid. At six months it was a good, clean-tasting wine, but with rather high and crude acid.

No. 2032. *Folle blanche*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 31, 1893, in good condition. The berries were rather large, juicy, and thick-skinned, in medium-sized bunches; they were mature, and commencing to rot. The must showed 23.05% of solid contents by spindle.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SAUTERNE TYPE.

Number	LOCALITY.	Vintage of	MUST.				WINE.		
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Total Acid as Tartaric, at 6 to 8 Months	Body
	Semillon.								
106	Glen Ellen	1883					10.58	.38	1.52
339	Lower Lake	1885	22.89		.55	.32			
434	San José	1885					13.00	.51	1.80
251	Natoma	1884	18.83	18.89	.54	.28			
252	Natoma	1884	21.69	20.99	.42	.28	12.36	.45	1.93
502	Cupertino	1886	18.40	18.29	.57	.23	8.93	.69	
745	Cupertino. (Long-pruned)	1887	24.89	24.12	.50	.40	12.54	.52	2.80
750	Cupertino. (Long-pruned)	1887	24.04	22.23	.54	.43	11.36	.47	2.60
753	Cupertino. (Short-pruned)	1887	25.26	25.53	.44	.45	12.82	.66	2.10
899	Cupertino. (Short-pruned)	1888	23.54	24.34	.34	.41	11.45	.54	2.60
900	Cupertino. (Long-pruned)	1888	22.81	22.85	.34	.42	11.27	.44	2.35
1131	Cupertino	1889	24.10	24.64	.41	.27			
1329	Cupertino	1890	23.70		.57				
2030	Cupertino	1893	24.55		.60				
1015	Fresno	1889	26.90	26.99	.31	.60			
1216	Fresno	1890	25.90	24.10	.32	.35			
1556	Paso Robles	1891	26.90		.38				
1648	Paso Robles	1892	22.15		.51				
1739	Paso Robles	1892	25.50		.39				
1668	Tulare	1892	24.00	24.64	.36	.45	12.54	.59	3.30
1798	Tulare	1893	21.50	20.24	.50	.28	9.50	.50	
2155	Tulare	1894	25.20		.35				
1657	Amador station	1892	23.65		.48				
1818	Amador station	1893	20.90	19.89	.63	.28			
2158	Amador station	1894	26.90		.38				
	Average, Natoma		**20.26**	**19.94**	**.48**	**.28**	**12.36**	**.45**	**1.93**
	Average, Cupertino		**23.47**	**23.14**	**.36**	**.37**	**11.39**	**.55**	**2.07**
	Average, Fresno		**26.40**	**25.55**	**.31**	**.47**			
	Average, Paso Robles		**23.82**		**.40**				
	Average, Tulare		**23.56**	**22.44**	**.40**	**.26**	**11.02**	**.59**	**3.30**
	Average, Amador station		**22.52**	**19.89**	**.49**	**.28**			
	Sauvignon blanc.								
253	Natoma	1884	21.66	21.22	.62	.31	12.75	.55	2.18
254	Natoma	1884	22.20	20.99	.53	.29	12.36	.45	2.10
335	Lower Lake	1885	24.20		.59				
1032	Fresno	1889	23.76	23.61	.79	.60			
1464	Fresno	1891	23.50	22.95	.76	.46	11.00	.53	2.74
1134	Cupertino	1889	26.10	26.12	.58	.37			
1317	Cupertino	1890	25.00		.58	.20	15.20	.48	2.12
2325	Tulare	1894	24.50		.35				
	Average, Natoma		**21.93**	**21.15**	**.57**	**.30**	**12.55**	**.50**	**2.14**
	Average, Fresno		**23.63**	**23.28**	**.77**	**.53**	**11.00**	**.53**	**2.74**
	Average, Cupertino		**25.55**	**26.12**	**.58**	**.28**	**15.20**	**.48**	**2.12**
	Sauvignon vert.								
724	Livermore	1887	22.67	22.67	.30	.42	11.82	.47	2.60
1513	Calistoga	1891	24.25	21.38	.53	.35	13.09	.53	2.20
1514	Asti, Sonoma County	1891	22.70	21.38	.44	.30	11.45	.53	2.55
490	Cupertino	1886	18.70	18.71	.42	.26	8.85	.53	1.75
697	Cupertino. (Long-pruned)	1887	23.01	23.23	.39	.34	12.00	.75	2.20
708	Cupertino. (Short-pruned)	1887	25.67	26.00	.47	.54	13.45	.44	2.60
880	Cupertino. (Short-pruned)	1888	21.39	21.38	.28	.40	9.90	.45	2.33
881	Cupertino. (Long-pruned)	1888	21.55	22.23	.27	.24			
1130	Cupertino	1889	23.30	22.95	.38	.39	11.91	.40	2.40
1275	Cupertino	1890	19.30		.51	.24	10.25	.42	2.20
2091	Cupertino	1893	24.10		.61				
1018	Fresno	1889	24.50	25.19	.46	.66			
1095	Fresno	1889	21.50	21.38	.58	.48	11.00	.47	2.70
1220	Fresno	1890	23.70	23.61	.47	.45			

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SAUTERNE TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST.				WINE.		
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Total Acid as Tartaric, at 6 to 8 Months	Body
	Sauvignon vert—Continued.								
1455	Fresno	1891	21.50	.....	.68	.....	11.09	.49	2.60
1433	Tulare	1891	20.85	.....	.30	.61	.....	.....	.....
1669	Tulare	1892	25.45	25.53	.37	.49	.....	.....	.....
1847	Tulare	1893	23.70	21.80	.54	.51	11.45	.44	2.60
2287	Tulare	1894	26.90	25.19	.38	.....	12.82	.41	2.30
1540	Paso Robles	1891	25.55	.....	.22	.....	.....	.....	.....
1733	Paso Robles	1892	23.70	.....	.35	.....	.....	.....	.....
1961	Paso Robles	1893	29.30	.....	.32	.....	.....	.....	.....
2218	Paso Robles	1894	25.65	.....	.30	.....	.....	.....	.....
1821	Amador station	1893	22.60	21.38	.59	.21	.....	.....	.....
2157	Amador station	1894	26.90	.....	.38	.....	.....	.....	.....
	Average, Cupertino	.....	**22.12**	**22.41**	**.41**	**.34**	**11.04**	**.50**	**2.24**
	Average, Fresno	.....	**22.55**	**23.39**	**.54**	**.53**	**11.04**	**.48**	**2.65**
	Average, Tulare	.....	**24.22**	**24.57**	**.40**	**.53**	**12.13**	**.42**	**2.45**
	Average, Paso Robles	.....	**26.05**	.....	**.30**	.....	.....	.....	.....
	Average, Amador station	.....	**24.75**	**21.38**	**.48**	**.21**	.....	.....	.....
	Folle blanche.								
258	Natoma	1884	22.10	21.97	.66	.27	12.36	.59	1.66
259	Livermore	1884	18.00	.....	.47	.....	8.75	.57	1.80
259*a*	Fresno	1884	20.70	20.17	.59	.23	.....	.....	.....
1482	Fresno	1891	20.65	20.00	.46	.54	10.58	.38	2.34
574	Sacramento (condensed must)	1886	23.70	24.12	.48	.36	.....	.....	.....
515	Cupertino	1886	20.00	19.96	.47	.39	8.23	.69	1.80
762	Cupertino. (Long-pruned)	1887	23.23	22.23	.71	.35	11.09	.61	2.20
763	Cupertino. (Short-pruned)	1887	25.14	24.64	.58	.37	13.00	.50	2.60
937	Cupertino. (Short-pruned)	1888	21.89	22.67	.51	.30	10.58	.54	2.05
938	Cupertino. (Long-pruned)	1888	21.41	21.80	.68	.26			
1167	Cupertino	1889	21.95	22.22	.54	.29	11.09	.44	1.95
1272	Cupertino	1890	18.15	.....	.76	.24	8.85	.53	2.44
2032	Cupertino	1893	23.05	.....	.77	.....	.....	.....	.....
1183	Mission San José	1889	22.60	.....	.44	.....	.....	.....	.....
1421	Mission San José	1890	26.10	.....	.71	.....	.....	.....	.....
1992	Mission San José	1893	21.50	.....	.53	.....	.....	.....	.....
2020	Mission San José	1893	20.50	19.82	.80	.23	10.36	.77	2.20
2244	Mission San José	1894	20.00	.....	.49	.....	.....	.....	.....
2297	Mission San José	1894	19.40	.....	.71	.....	.....	.....	.....
1837	Amador station	1893	19.30	.....	.92	.....	.....	.....	.....
1860	Amador station	1893	19.30	.....	.90	.....	.....	.....	.....
1452	Tulare	1891	18.60	.....	.61	.....	.....	.....	.....
1672	Tulare	1892	23.80	23.13	.45	.45	11.45	.44	2.70
1909	Tulare	1893	21.50	20.61	.68	.42	10.17	.59	2.10
2329	Tulare	1894	22.60	.....	.45	.....	.....	.....	.....
1534	Paso Robles	1891	18.10	.....	.70	.....	.....	.....	.....
1752	Paso Robles	.....	19.85	.....	.60	.....	.....	.....	.....
	Average, Fresno	.....	**20.65**	**20.08**	**.52**	**.38**	**10.58**	**.38**	**2.34**
	Average, Cupertino	.....	**21.85**	**22.25**	**.62**	**.31**	**10.47**	**.55**	**2.17**
	Average, Mission San Jose	.....	**21.68**	**19.82**	**.61**	**.23**	**10.36**	**.77**	**2.20**
	Average, Amador station	.....	**19.30**	.....	**.91**	.....	.....	.....	.....
	Average, Tulare	.....	**21.62**	**21.87**	**.54**	**.43**	**10.81**	**.51**	**2.40**
	Average, Paso Robles	.....	**18.92**	.....	**.65**	.....	.....	.....	.....

WHITE SOUTHERN FRENCH TYPE.

Properly speaking, there is no well-marked type of Southern French white wine. Few white wines are made in the "Midi," especially since the advent of the phylloxera, and of these only the dessert wines, sweet wines, and "vins de liqueur" have any extended reputation. The white grapes are generally used in small quantities with red grapes, to give smoothness and delicacy to the red wines. Few of the varieties of this group are promising for the production of white wines in California. From the Marsanne some good wines have been made, which can be used with advantage, where it succeeds well, as a blend with white grapes of more pronounced character. Some good wine has also been made from the Chauché gris, but the difficulty of handling the grapes and wine of this variety very much detract from its desirability. The Clairette blanche, which is shipped in such large quantities to Paris as a late table-grape, may find a like use here; it makes a high-class, delicately flavored wine. It is a very vigorous grower and a fairly heavy bearer, if its tendency to coulure can be overcome. This can, perhaps, be done by giving the vine a large development, instead of pruning it back to a close head.

CLAIRETTE BLANCHE.

(See Vit. Rept. 1883-85, p. 128; 1885-87, p. 96.)

Synonyms: Blanquette; Petit blanc.

Description.—Vine vigorous, with long, erect canes with rather short internodes; leaves of medium size, circular in outline, and with shallow sinuses, upper surface very dark green, cobwebby when young, becoming glabrous with age, lower surface thickly covered with a white down; bunches over medium in size, conical, heavily shouldered, close when not coulured; berries under medium in size, ovoid, white, crisp, juicy, and covered with bloom.

The Clairette blanche belongs altogether to southern France, within the region of olive culture; from below Valence, on the Rhone, to the Mediterranean coast, and along the same from Nice to the Spanish frontier. Within this region it has been extensively cultivated from ancient times to the present. It is used, not only to impart delicacy and spirit to red wines, but also by itself produces the wine commercially known as Picardan, as well as others locally designated as "Clairette." It is used for both dry and sweet wines. For the latter it is allowed to become overripe and shriveled on the vines. It is, besides, highly esteemed as a table-grape. It bears transportation well, and keeps well during the winter, being firm-fleshed; is crisp, sweet, and agreeably flavored.

The hardiness and vigorous growth of the Clairette are proverbial in southern France. No variety is longer-lived; it gives good crops even when old, and has resisted, longer than any other southern variety, the attacks of the phylloxera. It adapts itself readily to all soils, provided they are deep; on shallow, stony ground it is soon exhausted.

Some details regarding its growth and habit when grafted, as observed

at Mission San José by Prof. Hilgard (Vit. Rept. 1885-86), are of sufficient interest to find a place here:

The cuttings had become somewhat dry while waiting for favorable weather or for grafting, and considering this fact they showed a remarkable vitality. The grafts were made about two thirds on *Californica* stock, then in its third year from the planting of the seedling; the stocks ranged from three fourths to one and one fourth inches, and only one graft, as a rule, was put on each. The other third was put on *Riparia* and *Rupestris* stocks, varying, the first from one half to three fourths of an inch, the second rarely reaching one half inch; both being from the cutting, of the same age as the *Californica*.

Of the grafts put on *Californica*, about 88% grew; of those on *Riparia*, about 50%; of those on *Rupestris*, about 20%. Only the *Californica* stock even remotely kept pace with the growth of the grafts themselves, which pushed with such vigor that it was very difficult to keep their branches from being wrenched off by the wind before being tied. This brittleness of the wood must be well kept in view in handling this vine, which needs strong stakes at least 30 inches high above ground, and somewhat elaborate tying-up, to prevent its being wrenched off by the overweight of the top, above any low-tied withe or rope. Of the *Rupestris* and *Riparia* grafts, few were thus injured, because of the flexibility of the thin stock; but, owing to the disproportion in the size of stock and scion, many of the grafts sent out vigorous roots and continued doing so after the removal of one set; showing clearly that these two stocks are (at least on the strong adobe of the Mission hills) quite inadequate to the demands of so vigorous a grower as the Clairette.

All the grafts on *Californica* and many of those on *Riparia* bloomed profusely, and the majority set a fair proportion of berries, some bunches being almost without coulure; although, owing to the lateness of the bloom, the hot sunshine, and the violent winds, a great deal of coulure was naturally looked for, and in some cases made whole bunches fail entirely.

The Clairette is used in France for making wines of very diverse character; in the Department of Hérault it makes a good dry, white wine; in Var and Drôme it is used for the production of sparkling wines; in other localities a dry wine resembling Madeira is obtained from it; in others, a sweet wine with a strong "rancio" taste; while in many others it is used in small quantities as an addition to red wines.

It is best suited to a strong, clayey, well-drained soil, and is one of the best grapes to plant in a shady place. It is equally suited to either long or short pruning. Wherever planted in California it has proved itself a vigorous grower, with abundant and healthy foliage, and is resistant to diseases with the exception of coulure; though in France it is said to be peculiarly susceptible to the *Anthracnose ponctuée*. In the coast counties it has proved itself an unreliable bearer, sometimes giving good crops, but oftener badly damaged by coulure. In Tulare it has borne fairly well, and at the Foothill Station, in Amador County, it has been one of the best bearers among the white grapes. The average composition of the must has been: at Tulare, 24.3% of sugar and 0.35% of acid; at the Amador Station, 22.5% of sugar and 0.47% of acid; at Paso Robles, 23.5% of sugar and 0.39% of acid; at Mission San José, 22.0% of sugar and 0.55% of acid; at Cupertino, 20.6% of sugar and 0.46% of acid. In general, the wine has been of good quality, but not a good keeper. The best results, so far, have been from Tulare, where it makes a wine of rather more character and freshness than most of the other white grapes tried there; it also seems promising for Amador County. It ripens at the end of September in Amador County and the middle of October in Tulare; it resists the weather well, and can hang for a long time on the vines without damage.

ANALYSES OF MUSTS AND WINES.

CLAIRETTE BLANCHE.	Date of Picking.	MUST.				WINE.					
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol.		Total Acid as Tartaric, at Six to Eight Months.	Volatile Acid.	Body.	Ash.
						By Weight.	By Volume.				
1884—No. 264. Natoma Wine Co., Natoma		21.34	21.07	.45	.31	10.54	13.00	.43	.....	1.85	.21
1886—No. 481. J. Gallegos, Mission San José		17.50	17.22	.53	.28	7.09	8.85	.55	.....	2.10	.....
No. 510. E. W. Hilgard, Mission San José		20.00	.....	.87	.....	.....	.....	.....	.....	.....	.....
No. 513. F. Pohndorff, Jr., Mission San José		19.30	.....	.56	.....	6.89	8.61	.47	.....	1.58	.....
No. 535. E. W. Hilgard, Mission San José		21.50	20.76	.86	.36	7.99	10.00	.51	.....	1.80	.....
No. 535a.* E. W. Hilgard, Mission San José		21.50	20.76	.86	.36	7.85	9.82	.57	.....	1.92	.....
1887—No. 771. E. W. Hilgard, Mission San José	Oct. 21	25.45	25.20	.45	.35	9.92	12.36	.61	.14	2.20	.....
1888—No. 948. E. W. Hilgard, Mission San José	Oct. 26	23.32	22.22	.26	.28	9.05	11.27	.55	.....	1.80	.....
1889—No. 1170. J. Gallegos, Mission San José	Oct. 15	22.40	22.67	.41	.35	9.27	11.55	.40	.....	2.55	.....
No. 1196. J. T. Doyle, Cupertino	Oct. 24	18.15	17.17	.34	.45	6.95	8.70	.42	.....	1.35	.....
1890—No. 1398. J. T. Doyle, Cupertino	Oct. 18	21.10	.....	.53	.....	.....	.....	.....	.....	.....	.....
No. 1420. J. Gallegos, Mission San José	Oct. 28	26.30	.....	.54	.21	10.81	13.27	.42	.....	2.78	.....
1891—No. 1543. Paso Robles	Oct. 7	24.80	.....	.45	.....	.....	.....	.....	.....	.....	.....
1892—No. 1658. Amador station	Sept. 16	22.70	.....	.46	.....	.....	.....	.....	.....	.....	.....
No. 1701. Tulare	Sept. 27	22.40	.....	.29	.....	.....	.....	.....	.....	.....	.....
No. 1748. Paso Robles	Oct. 11	22.20	.....	.32	.....	.....	.....	.....	.....	.....	.....
1893—No. 1838. Amador station	Sept. 5	18.00	.....	.71	.....	.....	.....	.....	.....	.....	.....
No. 1862. Amador station	Sept. 12	21.70	.....	.56	.....	.....	.....	.....	.....	.....	.....
No. 1969. Tulare	Oct. 14	22.90	21.38	.38	.30	9.20	11.45	.53	.....	2.20	.....
No. 2029. Cupertino	Oct. 31	22.40	.....	.50	.....	.....	.....	.....	.....	.....	.....
No. 2065. Mission San José	Nov. 1	24.80	.....	.54	.....	.....	.....	.....	.....	.....	.....
1894—No. 2192. Amador station	Sept. 23	24.15	.....	.39	.....	.....	.....	.....	.....	.....	.....
No. 2225. Mission San José	Oct. 2	20.60	19.21	.62	.....	.....	.....	.64	.....	.....	.....
No. 2339. Tulare	Oct. 17	25.00	.....	.34	.....	.....	.....	.....	.....	.....	.....
No. 2345. Mission San José	Oct. 22	20.85	.....	.39	.....	.....	.....	.....	.....	.....	.....

* Fermented with skins.

RECORD OF TREATMENT.

No. 771. *Clairette blanche*, from E. W. Hilgard, Mission San José. Received October 24, 1887, in fair condition, but rather overripe. The bunches were imperfect, and showed much early coulure. The must showed 25.45% of solid contents by spindle and 0.45% of acid. The temperature of the grapes at crushing was 71°, and the maximum reached was 81°, on the third day. On the eighth day the wine was dry.

At two months the wine was not very well developed and was not of agreeable flavor. The lees showed some secondary ferments, so the wine was pasteurized. Two months later it was bright, and had developed some bouquet, but was not clean-tasting. It was racked for the third time. After this the wine did not change much; it remained bright, but did not develop any good qualities.

No. 948. *Clairette blanche*, from E. W. Hilgard, Mission San José. Received October 29, 1888, in fair condition; many bunches contained dried and half-dried berries. The must showed 23.32% of solid contents by spindle and 0.26% of acid. The temperature of the grapes at the maximum point of fermentation was 90°, and the wine was quite dry on the thirteenth day.

At one month the wine was racked and taken to the cellar. Two months later it was almost clear and of delicate flavor. At five months it was racked again, and the lees were sound. At ten months it showed good quality, but was not well developed. At thirteen months it was quite bright, but not quite clean-tasting. After this it deteriorated steadily, and at two years it was thrown away.

No. 1170. *Clairette blanche*, from E. W. Hilgard, Mission San José. Received October 16, 1889, in good condition, and completely mature. The must showed 22.4% of solid contents by spindle and 0.41% of acid. The temperature reached its maximum of 79° on the third day after crushing. On the fifth day the wine was dry, and was racked off the thick lees.

At two months the wine was clear, of very light color, of peculiar and hardly pleasant flavor, earthy taste, low acid, medium body, and full alcohol. The wine was racked and taken to the cellar. A month later it was much improved in flavor, and had developed a little bouquet. It was racked again in five months. The lees were sound when examined at three and seven months. At eight months the wine was not quite bright, had light but pleasant bouquet, agreeable flavor, still a slight earthy taste, but much improved since January, smoother and more developed. After this the wine gradually deteriorated, and, although it was pasteurized at seventeen months, it was found impossible to keep it longer.

No. 1196. *Clairette blanche*, from J. T. Doyle, Cupertino. Received October 24, 1889, in bad condition. The grapes were crushed, and moldy on account of the rain; they were quite mature, though the must showed only 18.15% of solid contents by spindle and 0.34% of acid. The fermentation reached its maximum on the fourth day at a temperature of 73.5°, and the wine went on fermenting slowly for several days after.

At two weeks the wine was racked. At two months it was clear, but only of fair quality. At this date it was racked again and taken to the cellar. The wine was weak and thin, and a month later it began to show signs of spoiling. It was pasteurized, but its keeping qualities were so bad that it could not be preserved.

No. 1398. *Clairette blanche*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 21, 1890, in fair condition, and mature. The must showed 21.1% of solid contents by spindle.

No. 1420. *Clairette blanche*, from Mission San José. Received October 31, 1890, in fair condition—a few of the grapes moldy and a few dried, mature. The must showed 26.3% of solid contents by spindle. It attained its maximum temperature of 81°, on the fourth day, and on the seventh day was nearly dry.

The wine was racked once during the first five weeks, at the end of which time it was bright, very slightly sweet, with some aroma, a pleasant flavor, low acid, high alcohol, and, in general, of good quality. At three months it was bright, had good bouquet and full characteristic flavor, and was generally improved. At five months it was pasteurized, as it had deteriorated and the lees showed a few lactic filaments. At fourteen months it was bright, possessed a little bouquet and full flavor, and was, in general, a good wine, though somewhat exhausted. At sixteen months it was bottled. At two years after bottling it was an extremely smooth, soft wine and well kept, considering the smallness of the sample made.

No. 1543. *Clairette blanche*, from Paso Robles station. A sample for must analysis arrived October 8, 1891, in good condition, mature; bunches of good size, well filled, but not compact. The must showed 24.8% of solid contents by spindle.

No. 1658. *Clairette blanche*, from Amador station. A sample for must analysis arrived September 19, 1892, in fair condition. The must showed 22.7% of solid contents by spindle.

No. 1701. *Clairette blanche*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 22.4% of solid contents by spindle.

No. 1748. *Clairette blanche*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 22.2 % of solid contents by spindle.

No. 1838. *Clairette blanche*, from Amador station. A sample for must analysis arrived September 8, 1893, in good condition; both bunches and berries were very small, grapes flavorless and not mature. The must showed 18.0 % of solid contents by spindle.

No. 1862. *Clairette blanche*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition; good-sized bunches of medium-sized berries, not quite mature. The must showed 21.7% of solid contents by spindle.

No. 1969. *Clairette blanche*, from Tulare station. Received October 16, 1893, in good condition. The bunches were under medium in size, loose, and irregular; berries varying from small to medium, crisp, and sweet. The must showed 22.9% of solid contents by spindle. The maximum temperature attained was 77°, on the third day, and in six days the must was nearly dry.

A month after crushing the wine had been racked once, and was clear and clean-tasting. At three months it was bright, with a little bouquet, some flavor, and full body; in general, a fair wine. At six months it had been racked three times, was bright and sound, with agreeable acid, and was fresher-tasting than most of the Tulare wines.

No. 2029. *Clairette blanche*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were of medium size, conical, with small wings, loose, but with no coulure; berries of medium size, crisp, juicy, and sweet. The must showed 22.4 % of solid contents by spindle.

No. 2065. *Clairette blanche*, from Mission San José. A sample for must analysis was received November 1, 1893, in good condition. The bunches were large, loose, conical, with large wings, some coulure; berries small and pulpy. The must showed 24.8 % of solid contents by spindle.

MARSANNE.

(See Vit. Rept. 1883–85, p. 127; 1885–87, p. 96.)

Description.—Vine vigorous; canes strong, with elongated internodes; leaves large, wrinkled, with rather deep lateral and closed petiolar sinuses, teeth short, wide, obtuse, upper surface glabrous, lower sparsely covered with an arachnoid down; bunch rather large, winged, and rather compact; berries of medium size, round, whitish, crisp, and juicy.

In general, the bunches are more compact in California than in France, and in Tulare the grapes acquire the hard, fleshy character distinguishing many of the Sherry varieties. At most of the stations this variety has shown itself a strong grower, with abundant foliage, and a good bearer, even with short-pruning. In Tulare it has done well, except where the alkali is too strong, bearing between four and five tons per acre. In the coast counties it bears from two to five tons per acre. It seems more susceptible to *oidium* in California than in France, and at the Amador station it has suffered from sunburn. At the latter station the vine grows well in red soil, but on a cool, granite soil it has not done so well, producing bunches of small and abortive berries.

It has given satisfaction in parts of Napa, Santa Clara, and San Mateo, but at the stations the grapes have generally been too high in sugar and too low in acid for a good and easily handled dry wine. At Tulare it gives a good, sweet wine of Sherry type, but is a failure for dry wine, having too much body and too little acid. Though not especially to be recommended for use alone, it is an excellent blend for varieties which lack alcoholic strength and body. Professor Husmann finds that it greatly improves either Sauvignon vert or Green Hungarian.

ANALYSES OF MUSTS AND WINES.

MARSANNE.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Body	Sugar
1890—No. 1412. Cupertino	Oct. 29	24.10	.....	.66	.27	10.35	12.82	.50	2.50	....
1892—No. 1619. Tulare	Aug. 28	25.65	23.67	.38	.45	18.05*	22.18	.43	3.66	.94
1893—No. 1856. Amador station	Sept. 12	23.70	.....	.48	....	.....	.....	.....	.....	....
No. 1960. Paso Robles.	Oct. 12	24.10	.....	.24	....	.....	.....	.....	.....	....
No. 2000. Tulare	Oct. 22	26.10	25.76	.41	.50	10.27	12.73	.43	2.90	....
No. 2097. Cupertino	Nov. 6	25.90	.....	.63	....	.....	.....	.....	.....	....
1894—No. 2162. Amador station	Sept. 15	26.70	.....	.34	....	.....	.....	.....	.....	....
No. 2203. Tulare	Sept. 25	27.35	.....	.26	....	.....	.....	.....	.....	....

*Fortified.

RECORD OF TREATMENT.

No. 1412. *Marsanne*, from J. T. Doyle, Cupertino. Received October 30, 1890, in fair condition. The grapes had passed maturity, but were not very sweet; some had commenced to rot, all more or less shriveled, but tasting well. The must showed 24.1% of solid contents by spindle. The fermentation reached its maximum on the fourth day, at a temperature of 79°, and continued for seven days, when the wine was nearly dry.

At five weeks the wine had been racked twice, and was clear, of delicate bouquet and flavor, smooth, with medium acid, and generally good. At three months it was bright, of marked and agreeable flavor and good bouquet, and generally improved. Successive tastings during the first year showed a gradual improvement, and at fourteen months the wine was bright, clean-tasting, and of high quality. The wine was bottled, some at sixteen months and some at twenty-four months. The latter bottling did not keep well, but the former at ten months after bottling was bright, smooth, and good, but a little flat.

No. 1619. *Marsanne*, from Tulare station. Received September 1, 1893, in good condition. The must showed 25.65% of solid contents by spindle. The must, having high sugar contents, low acid, and showing signs of not fermenting well, was made into a sweet wine. The fermentation reached its maximum on the third day, at a temperature of 78°, and on the sixth day, while the must was still sweet, it was fortified.

The wine was clear three weeks after crushing, and was racked. At three months it was bright, clean-tasting, with low acid, but with hardly sufficient sweetness. At six months more alcohol and a little sugar were added, and the wine put into a hot chamber at a temperature of 95°, where it remained for three months. At ten months it was bright, of good flavor, and promised to make a good Sherry.

No. 1856. *Marsanne*, from Amador station. A sample for must analysis arrived September 15, 1893, in poor condition, and diseased. Bunches were of medium size, compact; berries small to medium, well colored. The must showed 23.7% of solid contents by spindle.

No. 1960. *Marsanne*, from Paso Robles station. A sample for must analysis was received October 14, 1893, in good condition. Bunches were large, irregular, and loose; berries medium size, round, very hard, and fleshy, not quite mature. The must showed 24.1% of solid contents by spindle.

No. 2000. *Marsanne*, from Tulare station. Received October 23, 1893, in good condition. Bunches were of medium size, short, irregularly cylindrical, sometimes shouldered, close; berries of medium size, with many smaller ones, round, thin-skinned, of pleasant flavor, quite mature, some berries softening and drying up. The must showed 26.1% of solid contents by spindle. The must was dry in five days, the fermentation reaching its height on the third day at a temperature of 83°.

The wine was clear one month after crushing, and was racked twice during the first six weeks. At three months, three weeks after the third racking, it was bright, heavy-bodied, with some flavor and bouquet, but lacking in cleanness of taste and freshness. At six months it was bright and apparently sound, but the odor was not good and the taste slightly bitter.

No. 2097. *Marsanne*, from J. T. Doyle, Cupertino. A sample for must analysis arrived November 6, 1893, in good condition. Bunches were of medium size, irregular, winged or branched, well filled, but with many abortive berries; normal berries, of medium size, round, soft. The must showed 25.9% of solid contents by spindle.

CHASSELAS DORÉ.

(See Vit. Rept. 1885-86, p. 100.)

Synonyms: Chasselas de Fontainebleau; Gutedel; Sweetwater.

There are planted in California many of the innumerable varieties of Chasselas which are known in Europe, but the one which is best known and most extensively planted is the true Chasselas doré of France. All the members of the Chasselas tribe are distinguished by the brownish color of the young shoots and leaves, the round shape of the berries, and the peculiar texture of the skin and the flesh. The description here given is that of the typical Chasselas doré.

Description.—A rather vigorous grower, with medium or somewhat slender canes of a reddish-brown color; young shoots of garnet color, nearly or quite glabrous; leaves rather below average size, a little longer than wide, glabrous above and nearly so below, except for a few hairs on the main nerves, with well-marked sinuses, the petiolar one often closed, the petiole long, rather slender, and rose-colored; bunches of medium or over-medium size, conico-cylindrical, shouldered, more or less compact; berries medium to large, with firm but tender skin, small seeds, of delicate flavor and texture, at first crisp but becoming soft with full maturity. The grapes are of a clear green color, tinged with a beautiful golden bronze where exposed to the sun.

This variety should not be confused with the Listan or Palomino, which goes under the name of Golden Chasselas in Napa County and other localities. The latter is a totally different grape, belongs to the Sherry type, and is in no sense a Chasselas of any kind.

As a table-grape the Chasselas has failed to satisfy the public taste here as it does in France, except to a limited extent as one of the earliest grapes that can be put on the market. It is too delicate to be used for any but the local markets, as it will not bear shipping very well, and notwithstanding its admirable flavor and texture it is not striking enough in appearance to meet the demands of our markets. In France the Chasselas is not generally much valued as a wine-grape; though the Gutedel wines of Germany and Switzerland are light, pleasant, and much esteemed. On the whole, this variety has given more satisfaction in California as a wine-grape than as a table-grape.

As a wine-grape its value depends altogether on the conditions under which it is grown. In the coast counties it is healthy, fairly vigorous, and productive; in the interior valleys it is a failure. On warm, well-drained southern or western slopes in the central coast counties it produces an excellent wine, clean-tasting, full-bodied, without much distinctive flavor or aroma, but developing a good bouquet with age, and keeping well. In these situations it has the advantage, especially desirable for white wines, of attaining perfect maturity, and even passing it without becoming too high in sugar or falling so low in acid as to make it difficult to ferment. Grapes from low or cold soils often ferment badly and easily go wrong. The average must composition has been: at Cupertino, 21.9% of sugar and 0.35% of acid; at Mission San José, 22.2% of sugar and 0.37% of acid; at Tulare, 22.3% of sugar and 0.23% of acid. At Cupertino the average crop has been four tons per acre; at Tulare, less than two tons. In none of these localities are the results

as good as those obtained with this grape on warm slopes of Napa, Sonoma, and Santa Clara, where the conditions insure a more favorable must composition than is indicated by the above averages.

The Chasselas is almost always pruned short, though occasionally in rich soils it has been found advantageous to prune it long, but only when the grapes are to be used for eating. It is of great importance to choose fertile canes in the propagation of this variety, in order to insure good-bearing vines. The vines are somewhat subject to attacks of fungous diseases, and succumb quickly to the phylloxera. There is a variety of the Chasselas doré known as the Parsley vine, in French "Cioutat," having deeply cut or lacinate leaves, but which, with the exception of the leaves, is identical with the type.

TABLE OF PRODUCTION.

CHASSELAS DORÉ.	Number of Vines.	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking.
1887—No. 696 (long-pruned). J. T. Doyle, Cupertino	20	210	10.5	Oct. 5
1888—No. 917 (short-pruned). J. T. Doyle, Cupertino	20	130	6.5	Oct. 18
No. 918 (long-pruned). J. T. Doyle, Cupertino	20	320	16.0	Oct. 18
1889—Row 25 (short-pruned). J. T. Doyle, Cupertino	20	250	12.5	Oct. 9

ANALYSES OF MUSTS AND WINES.

CHASSELAS DORÉ.

		Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric, at Six to Eight Months	WINE. Body
1886—No. 476.	J. T. Doyle, Cupertino	Sept. 15	17.50	----	.40	.25	6.89	8.61	.41	----
1887—No. 696.	J. T. Doyle, Cupertino	Oct. 5	23.17	23.61	.31	.33	9.34	11.64	.53	1.87
1888—No. 917 (short-pruned).	J. T. Doyle, Cupertino	Oct. 18	22.89	24.12	.20	.50	9.20	11.45	.38	2.25
No. 918 (long-pruned).	J. T. Doyle, Cupertino	Oct. 18	22.24	22.67	.22	.33	9.20	11.45	.28	2.28
1889—No. 1112.	J. Gallegos, Mission San José	Sept. 28	22.60	21.80	.25	.38	----	----	----	----
1890—No. 1260.	J. Gallegos, Mission San José	Sept. 23	21.93	----	.40	.26	----	----	----	----
No. 1267.	J. T. Doyle, Cupertino	Sept. 29	22.30	----	.44	.29	----	----	----	----
1891—No. 1443.	Tulare	Aug. 26	24.53	----	.18	----	----	----	----	----
No. 1561.	Mission San José	Oct. 6	22.15	----	.40	----	9.20	11.45	.39	1.80
1892—No. 1677.	Tulare	Sept. 18	20.20	----	.29	----	7.92	9.90	.40	2.70
No. 1776.	Mission San José	Oct. 13	20.85	21.38	.37	----	8.84	11.00	.55	2.10
1893—No. 1948.	Mission San José	Oct. 14	23.70	----	.46	----	----	----	----	----
No. 2086.	J. T. Doyle, Cupertino	Nov. 6	23.10	----	.53	----	----	----	----	----
1894—No. 2247.	Mission San José	Oct. 3	21.90	----	.35	----	----	----	----	----
No. 2324.	Tulare	Oct. 13	22.15	----	.21	----	----	----	----	----

RECORD OF TREATMENT.

No. 696. *Chasselas doré*, from J. T. Doyle, Cupertino. Received October 6, 1887, in good condition, but overripe. The bunches showed a little coulure, and varied from loose to compact; the berries were uneven in size. The must showed 23.17% of solid contents by spindle and 0.31% of acid. The temperature of the grapes at crushing was 69°, and the maximum reached was 85°, on the second day. The fermenting must was thoroughly aërated for twenty minutes on the first, second, third, and fourth days. The wine was quite dry on the eighth day.

At two weeks the wine was racked and taken to the cellar. At two months it was a thin wine, and the acid was evidently increasing, so it was racked again and pasteurized. Five days after pasteurizing it was still a little cloudy, had pleasant flavor and aroma, but was thin and too acid. At eight months it was nearly bright, and was a pleasant wine, with some bouquet, but showed the effect of secondary fermentation.

Nos. 917 and 918. *Chasselas doré*, from J. T. Doyle, Cupertino. Received October 19, 1888, in good condition. No. 917, which was from short-pruned vines, showed less coulure than No. 918, from long-pruned vines. The composition of the must of No. 917 was 22.89% of solid contents by spindle and 0.20% of acid; that of No. 918, 22.24% of solid contents by spindle and 0.22% of acid. The grapes of both lots, which were quite mature, were crushed together. The temperature of the must at the maximum was 85°. The wine fermented slowly, and was dry in fifteen days.

At three weeks the wine was racked and placed in the cellar. At seven weeks it was racked again. At three months it tasted thin and characterless. Two months later it was necessary to pasteurize it, as it showed signs of going wrong. Three months later it was racked, and at ten months it showed some good qualities, but was not quite bright. At fourteen months some wine bottled at eight months tasted quite as good as the wine in the keg. At sixteen months the wine, both in the keg and in the demijohn, was clean-tasting, but not of high quality; it was racked again. At seventeen months more of the wine was bottled. At eighteen months it was given a half-hour treatment in an electric machine. At twenty-one months it was bright, and of fair quality; the flavor was rather agreeable, but the bouquet and after-taste were not pleasing. A month later the rest of the wine was bottled. At two years and four months the wine bottled at eight months was bright, of neutral flavor, without bouquet, and with suspicion of bad acid. That bottled at seventeen months was bright and of more agreeable flavor than the above; there was a slight deposit in the bottles. That bottled at twenty-two months was similar to the second bottling, but had made no deposit. Nineteen months later the first and second bottlings were not nearly so good as the last, which had been treated by electricity.

No. 1112. *Chasselas doré*, from J. Gallegos, Mission San José. Received October 1, 1889, in good condition. The bunches were large and close; the berries large. The must showed 22.6% of solid contents by spindle and 0.25% of acid. The must was fermented in a closed keg surrounded by a jacket of water kept at a temperature of 65.5°. The wine was drawn off the thick lees on the eighteenth day.

At two months, when it was racked and taken to the cellar, it was clear and good, but somewhat thin. Two months later it was bright and smooth, somewhat characterless, and undeveloped. At five months the lees showed unsound ferments, and the wine was pasteurized. Six weeks later it was clear and sound. At nine months it was bright, smooth and agreeable, but with little character. A month later an examination of the lees showed no unsound germs; the wine was racked, and was clear and improved, but lacking in acid. At fifteen months it was bright and sound, but tasted thin. Six weeks later it was bottled. A year after bottling it was in good condition and had made a little deposit; it was smooth and fairly pleasing, but somewhat exhausted.

No. 1260. *Chasselas doré*, from Mission San José. A sample for must analysis was received September 26, 1890, in good condition. Bunches and grapes were large, the latter mature. The must showed 21.93% of solid contents by spindle.

No. 1267. *Chasselas doré*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 2, 1893, in good condition, and mature. The berries were, in general, large, but mixed with many small ones. The must showed 22.3% of solid contents by spindle.

No. 1448. *Chasselas doré*, from Tulare station. A sample for must analysis arrived August 29, 1891, in good condition. The must showed 24.53% of solid contents by spindle.

No. 1561. *Chasselas doré*, from Mission San José. Received October 9, 1893, in good condition; mature and not shriveled, but turning pink. The must showed 22.15% of solid contents by spindle. The must reached its highest temperature on the fourth day at 82°, and was dry on the seventh day.

At six weeks from crushing the wine was nearly clear, and of good flavor. At five months it had been racked twice, was bright, with some bouquet, and good though not marked flavor, very soft and pleasing, maturing slowly. During the first year it was racked four times, and at seventeen months it was bottled, when it showed little improvement and lack of body.

No. 1677. *Chasselas doré*, from Tulare station. Received September 21, 1892, in good condition, but rather soft. The must showed 20.2% of solid contents by spindle. The fermentation was cool, and lasted six days.

At five weeks the wine was quite dry and clear, and was racked for the second time. At four months it was bright, with a light but pleasing bouquet and flavor—a very smooth, neutral wine. It continued to improve for seven or eight months, after which it deteriorated, and though it remained bright and sound, it became mawkish and insipid.

No. 1776. *Chasselas doré*, from Mission San José. Received October 15, 1892, in good condition. The must showed 20.85% of solid contents by spindle. The must was fermented with 23° of Johannisberger, and went through in six days, attaining a maximum temperature of 82° on the fourth day.

The wine was clear in three weeks, and was racked twice during the first month. At three months it was an excellent wine, with rich flavor, aroma, and good body. At eight months it was in first-class order, of good quality, and almost mature. At eighteen months the wine was mature, and was bottled.

No. 1948. *Chasselas doré*, from Mission San José. A sample for must analysis was received October 14, 1893, in poor condition—very moldy, but fine grapes and fully ripe. The must showed 23.7% of solid contents by spindle.

No. 2086. *Chasselas doré*, from J. T. Doyle, Cupertino. A sample for must analysis was received November 6, 1893, in good condition. Bunches were of medium size, well filled; berries overripe and soft, but with no raisin taste. The must showed 23.1% of solid contents by spindle.

UGNI BLANC.

(See Vit. Rept. 1883-85, p. 137.)

Synonyms: Maccabeo; Queue de Renard; Clairette à grains ronds.

Description.—Vine vigorous, with long, reddish-gray canes of average thickness and long internodes; leaves of medium size, with upper sinuses deep and often closed, lower sinuses shallower and open, teeth large and acute, upper surface yellowish, downy when young, lower surface whitish, with a thick down; bunch long, cylindrical, with or without small shoulders, well filled; berries of medium size, round, white, becoming russet on one side when well ripened, soft, juicy, with tough but easily broken skin.

The Ugni blanc is very late, and only ripens well in the hottest regions of Provence. It is not exacting as to the nature of the soil in which it grows, providing it is not too wet. It buds out late in spring, thus escaping the late frosts. It gives, especially when grown on rocky hills, a generous wine, which, with age, acquires something of the character of Marsala. It is to this grape that the white wines of Cassis, in Bouches du Rhone, owe their quality.

So far, it has not shown qualities in California that would recommend it for cultivation in any locality. Its average yield has been two tons per acre at Cupertino and three tons at Tulare. Contrary to the reputation it has in France, it is here very easily injured by the weather and is not a particularly robust grower. It produces a light, acid wine, which is of fair quality, matures quickly, and is useful for blending. It is, however, little, if at all, better for this purpose than several others which are of superior productiveness. The average composition of the must at Mission San José and at Cupertino has been 20.9% of sugar and 0.76% of acid; at Tulare, 22.8% of sugar and 0.40% of acid.

TABLE OF PRODUCTION.

UGNI BLANC.	Number of Vines	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking
1887—No. 785 (long-pruned). J. T. Doyle, Cupertino	20	116	5.8	Oct. 27
1888—No. 954 (long-pruned). J. T. Doyle, Cupertino	18	110	6.1	Nov. 6
1889—No. 1195 (short-pruned). J. T. Doyle, Cupertino	19	140	7.3	Oct. 23

ANALYSES OF MUSTS AND WINES.

UGNI BLANC.	Date of Picking	MUST.				WINE.				
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at 6 to 8 Months	Volatile Acid	Body	Ash
1884—No. 274. Natoma Wine Company, Natoma	Oct. 27	20.70	20.61	.59	.49	8.91	11.10	.51	----	2.00	.30
1887—No. 785. J. T. Doyle, Cupertino	Oct. 27	21.46	20.99	.87	.47	7.71	9.62	.56	.15	2.60	----
1888—No. 954. J. T. Doyle, Cupertino	Nov. 6	19.75	20.03	.50	.37	7.78	9.73	.45	----	2.30	----
1889—No. 1195. J. T. Doyle, Cupertino	Oct. 23	22.80	21.80	.51	.29	9.20	11.45	.39	----	2.00	----
1890—No. 1405. J. T. Doyle, Cupertino	Oct. 20	23.05	----	.91	.34	9.05	11.27	.74	----	1.54	----
1892—No. 1704. Tulare	Sept. 27	22.15	----	.45	----	----	----	----	----	----	----
No. 1737. Paso Robles	Oct. 10	24.20	----	.51	----	----	----	----	----	----	----
1893—No. 2026. J. T. Doyle, Cupertino	Oct. 31	22.40	----	1.00	----	----	----	----	----	----	----
1894—No. 2352. Tulare	Oct. 27	23.30	----	.36	----	----	----	----	----	----	----

RECORD OF TREATMENT.

No. 785. *Ugni blanc*, from J. T. Doyle, Cupertino. Received October 28, 1887, in good condition. The bunches were loosely pendent, and showed little coulure; the berries were very thin-skinned and juicy, perfectly round, and with little bloom; a few were shriveled and dried. The must showed 21.46% of solid contents by spindle, and 0.87% of acid. The temperature of the grapes at crushing was 74°, and the maximum reached was 84°, on the second day. The wine was dry on the fourth day.

At two weeks the wine was drawn off for the first time. At two months it showed little aroma and sharp acid. At four months the lees showed some acetic ferment, and the wine was drawn off and pasteurized. At seven months it was still cloudy, tasted green, and was highly acid; it had developed some bouquet, but was, on the whole, rather thin and poor. At eight months it was bright, but later it deteriorated.

No. 954. *Ugni blanc*, from J. T. Doyle, Cupertino. Received November 7, 1888, in good condition, and crushed the following day. The must showed 19.75% of solid contents by spindle and 0.50% of acid. The temperature of the grapes at crushing was 68°, and the maximum reached was 81°, on the fourth day.

At two weeks the wine was drawn off the thick lees, and at one month it was taken to the cellar. At two months it was a thin, acid wine, with little aroma and low alcohol At four months it was racked again, and the lees found to be healthy. At ten months it was clear, and had improved. At thirteen months the wine which had been put in bottle at four months was better than the wine in the keg, both in flavor and cleanness of taste. At fifteen months it was clear, mature, neutral, but fairly agreeable. A month later it was racked. At this time it was at its best, and later it deteriorated.

No. 1195. *Ugni blanc*, from J. T. Doyle, Cupertino. Received October 24, 1889, in bad condition—injured by rain, but quite mature. The bunches were very unequal in size, the larger ones very large, long, cylindrical, shouldered, and compact; the berries were round and of medium size, with thin but tough skin, varying from green to pinkish; flesh very soft and juicy; stems of medium size, pedicels long and slender. The must showed 22.8% of solid contents by spindle and 0.51% of acid. The temperature of the grapes at crushing was 68°, and the maximum reached was 76.5°, on the third day. The wine continued fermenting slowly for a long time.

At two weeks the wine was drawn off the thick lees. At six weeks it was clear, very light in color, smooth, with faint aroma and agreeable flavor, with sufficient body and alcohol, and, in general, rather pleasing. At two months it was racked and taken to the cellar, and at three months it was bright and had improved. At six months it was racked again, and at seven months the lees were examined and found to be healthy. At eight months the wine was bright, had developed some bouquet, and was, in general, a smooth, light, and pleasing wine, nearly mature. After this it deteriorated.

No. 1405. *Ugni blanc*, from J. T. Doyle, Cupertino. Received October 23, 1890, in fair condition, and mature. The must showed 23.05% of solid contents by spindle. The fermentation reached its maximum on the third day at a temperature of 82°, and lasted eight days.

A month from crushing the wine was nearly clear, had full flavor and acid, light body, and clean taste. At two months from crushing it was racked, and at three months was bright, and showed some improvement and the development of some bouquet. At five months the lees showed a few filaments, but the taste was unaffected; it was pasteurized for safety. It remained bright, and at fourteen months was mature, had a good flavor, a little bouquet, high but somewhat green acid, and in general was of fair quality. At fifteen months it was bottled. At two years it showed good qualities, but was somewhat exhausted.

No. 1704. *Ugni blanc*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition, but very small, having been grown on alkali soil. The must showed 22.15% of solid contents by spindle.

No. 1737. *Ugni blanc*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 24.2% of solid contents by spindle.

No. 2026. *Ugni blanc*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 31, 1893, in good condition. The bunches were over medium in size, long-cylindrical, scarcely shouldered, and close; the berries of medium size, very juicy, and thick-skinned, with high acid, and not quite mature. The must showed 22.4% of solid contents by spindle.

VERDAL.

(See Vit. Rept., 1885-86, p. 104.)

Synonyms: Aspiran blanc; Servan blanc (?).

This grape has found quite extended acceptance for table use, and to some extent for wine. It is a grape of southern France, particularly the Languedoc, and in its three varieties—the red, gray, and white—is quite extensively grown, for both table use and wine-making. The white variety, which is less prolific than the other two, is used for the table only, while the other two produce very popular table wines, of which the red, however, lacks sufficient color for commercial use, and neither it nor the white is exported. The wines possess a light aroma or perfume peculiar to this grape. The vine is pruned sometimes with one long spur, but mostly altogether short.

Description.—Vine of medium vigor and rather hardy; canes somewhat slender and half erect; leaves of average size, glabrous on both surfaces, except below near the axils of the main nerves, sinuses well marked and generally closed, giving the leaf the appearance of having five holes, in the manner of those of Cabernet Sauvignon; teeth long, unequal, and somewhat acuminate; bunches large to very large, irregularly long-conical, without any or with small shoulders, well-filled to compact; berries large to very large, crisp, with thick but tender skin, agreeable, but without marked flavor.

This variety has proved to be a good grower and prolific bearer almost wherever grown, is little subject to disease, and shades its grapes well. In the cooler localities it is occasionally injured by coulure and by the abortion of its berries. The vines are sometimes pruned long, but in places suited to the variety it will bear enough, or even too much, with short-pruning; long canes tend to exhaust the vine. The grapes have been successful for table use, on account of their lateness and their good keeping qualities; they will hang and remain sound on the vines later than almost any other variety. As a wine-grape, it is less recommendable, making in the Coast Range a thin wine of little character.

In the hot interior valleys it is at its best as a wine-grape. At Tulare, where it produces nearly fourteen tons per acre, it makes a light, agreeable wine, with little flavor or bouquet, but easily fermented and handled; a wine which, at six or eight months, is at its best, bright, and clean-tasting. It is too light to keep for a long time, but would make a good blend with heavy-bodied, alcoholic wines. For this purpose it is, however, not equal to the Burger, but has the advantage of being at the same time a good table-grape, and of resisting the weather better than the latter.

The average composition of the must at Tulare has been 18.4% of sugar and 0.57% of acid. This could probably be improved by preventing the vines from bearing so heavily. At Paso Robles the grape is promising, being vigorous and productive, and having an average must composition of 21.6% of sugar and 0.51% of acid, but has not yet been sufficiently tried for wine.

ANALYSES OF MUSTS AND WINES.

VERDAL.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	WINE. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric, at Six to Eight Months	WINE. Volatile Acid	WINE. Body	WINE. Ash
1885—No. 367. D. C. Feely, Patchen		14.91	.....	.53	.26	6.42	8.07	.52	.....	1.80	.19
1886—No. 512. R. Wegener, Livermore		21.80	21.07	.38	.30	8.27	10.36	.41	.....	1.80	.....
No. 585. D. C. Feely, Patchen		17.00	15.11	.63	.47	6.75	8.46	.55	.....	1.55	.....
1887—No. 701. R. Wegener, Livermore	Oct. 5	22.84	23.22	.52	.37	8.62	10.75	.43	.08	2.60	.....
No. 803. W. G. Klee, Glenwood	Nov. 29	20.65	20.10	.75	.40	.....	.....	.....	.....	.....	.....
1889—No. 1164. J. T. Doyle, Cupertino	Oct. 12	21.50	.....	.48	.....	.....	.....	.....	.....	.....	.....
No. 1188. J. Gallegos, Mission San José	Oct. 13	19.50	.....	.57	.....	.....	.....	.....	.....	.....	.....
1890—No. 1361. J. T. Doyle, Cupertino	Oct. 14	18.95	.....	.84	.22	7.78	9.73	.46	.....	1.80	.....
No. 1430. J. Gallegos, Mission San José	Oct. 27	22.15	.....	.63	.....	.....	.....	.....	.....	.....	.....
1891—No. 1453. Tulare	Aug. 27	18.82	18.30	.53	.....	6.42	8.07	.40	.....	2.60	.....
1892—No. 1705. Tulare	Oct. 4	20.40	19.75	.42	.43	8.84	11.00	.46	.....	2.30	.....
1893—No. 1912. Tulare	Oct. 5	18.80	17.70	.75	.39	7.43	9.27	.48	.....	2.60	.....
No. 1964. Paso Robles	Oct. 12	22.85	.....	.52	.....	.....	.....	.....	.....	.....	.....
No. 1982. Tulare	Oct. 17	19.30	18.46	.58	.25	7.64	9.54	.45	.....	2.60	.....
No. 2082. Paso Robles	Nov. 3	22.70	21.63	.51	.37	8.34	10.12	.51	.....	2.25	.....
1894—No. 2233. Mission San José	Oct. 3	20.40	.....	.53	.....	.....	.....	.....	.....	.....	.....
No. 2342. Tulare	Oct. 20	19.30	17.99	.59	.....	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 701. *Verdal*, from R. Wegener, Livermore. Received October 7, 1887, in good condition. The bunches were large, loose, and showed a little coulure; the berries were large, and well covered with bloom. The must showed 22.84% of solid contents by spindle and 0.52% of acid. The temperature of the grapes at crushing was 65.5°, and the maximum reached was 89°, on the third day. The wine was drawn off on the eleventh day.

At two months it was clear, with good aroma, light and pleasant acid, but was rather thin. A month later it was racked again. At sixth months the lees showed traces of unsound ferments, so the wine was racked and pasteurized. At eight months it was bright, with little bouquet—a fair, neutral wine.

No. 803. *Verdal*, from W. G. Klee, Santa Cruz Mountains. A sample for must analysis was received November 30, 1887, in fair condition, some of the bunches showing traces of mold. The bunches were very large and loose, on account of coulure. The berries were very large, and with much less bloom than the sample from Livermore; however, they were larger than those of the latter sample, and of more agreeable flavor. The must showed 20.65% of solid contents by spindle and 0.75% of acid.

No. 1164. *Verdal*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 15, 1889, in good condition. The bunches were large to medium, pyramidal, winged, loose; the berries very large, ellipsoidal, with thick but tender skin, of green to yellowish-green color, well covered with bloom; the flesh crisp and juicy, sweet, and agreeable; the stems slender and green; the pedicels short and thick. The must showed 21.5% of solid contents by spindle and 0.48% of acid.

No. 1188. *Verdal*, from J. Gallegos, Mission San José. A sample for must analysis was received October 16, 1889, in good condition. The grapes were rather larger than those from Cupertino, but were otherwise identical. The must showed 19.5% of solid contents by spindle and 0.57% of acid.

No. 1361. *Verdal*, from J. T. Doyle, Cupertino. Received October 17, 1890, in good condition, but not mature. The must showed 18.95% of solid contents by spindle. The fermentation was slow and cool, attaining its maximum temperature of 78° on the fourth day, and finishing on the sixth day.

The wine was racked twice during the first two months, but was slow in clearing. At three months it was bright, with a slight bouquet, but very little flavor, high acid, and somewhat suspicious after-taste—generally of poor quality and without character. At five months the lees showed a little lactic ferment, and the wine was pasteurized. At seven months the wine was bright, had improved somewhat in taste and bouquet, but tasted green, and was without much character. At fourteen months the wine was mature, and at sixteen months it was bottled. At two years the wine was examined and found to be bright; it was thin and neutral, but smooth and somewhat agreeable.

No. 1430. *Verdal*, from J. Gallegos, Mission San José. A sample for must analysis was received October 30, 1890, in good condition, and mature. The must showed 22.15% of solid contents by spindle.

No. 1453. *Verdal*, from Tulare station. Received August 29, 1891, in good condition, but not ripe. The must showed 18.82% of solid contents by spindle. The fermentation lasted five days, was cool and complete, and reached its maximum temperature of 76° on the third day.

The wine remained cloudy for some time, but was bright at seven weeks after crushing. During the first three months it was racked twice, and at four months it was bright, water-white, with a little bouquet—generally neutral, but drinkable, and well advanced for its age. Tastings at six and eight months showed it to have improved somewhat and to have kept perfectly. At fourteen months the wine was mature, thin, and without character; at this age it was bottled.

No. 1705. *Verdal*, from Tulare station. Received October 5, 1892, in excellent condition. The grapes were of very large size, and mature. The must showed 20.4% of solid contents by spindle. The fermentation was somewhat slow, lasting eight days, and reaching its maximum temperature of 83° on the third day.

At one month the wine was clear, fresh-tasting, and quite dry; it was racked twice during the first three months, and at the end of that time was bright, with some bouquet and flavor, a nutty taste, and signs of early maturity. It remained bright, sound, and generally in good order for sixteen months, when it was bottled.

No. 1912. *Verdal*, from Tulare station. Received October 6, 1893, in fairly good condition—a trifle bruised, but not at all moldy. The must showed 18.80% of solid contents by spindle. The amount received (752 lbs.) was divided into three lots, one of which was fermented in the ordinary way, and the others with special ferments. The normal fermentation, which was made for comparison, was prompt and thorough, lasting four days, and attaining a maximum temperature of 81° on the second day.

The wine was clean-tasting, and nearly clear three weeks after crushing. Four months after the first drawing-off it was bright, with full acid, but with little flavor and no bouquet. Three months later it had made little change.

No. 1964. *Verdal*, from Paso Robles station. A sample for must analysis arrived October 14, 1893, in fair condition. The bunches were large, irregular, and compact; the berries large (smaller than those from Tulare), and not quite ripe. The must showed 22.85% of solid contents by spindle.

No. 1982. *Verdal* (*Napoleon*), from Tulare station. Received October 19, 1893, in good condition. Bunches and berries both extremely large; berries not very sweet, but riper than those received under the name of Verdal from the same station (No. 1912). The must showed 19.3% of solid contents by spindle. The must fermented quickly, reached a temperature of 82° on the third day, and was dry on the fourth.

The wine cleared quickly, and three months from crushing, when it had been racked twice, it was bright and clean-tasting. Six months after making, it was in good condition, fresh-tasting, and agreeable, but with little character.

No. 2082. *Verdal*, from Paso Robles station. Received November 4, 1893, in good condition. The bunches were very irregular in size and shape, large, and either loose or compact; the berries were large to very large, sweet, with very little flavor. The must showed 22.7% of solid contents by spindle. The fermentation was rather slow and cool, the temperature not rising above 77°.

The wine was clear at five weeks, having been racked twice. At ten weeks it was bright, clean-tasting, with some bouquet and flavor, and medium acid. At six months it was smooth and agreeable, with some bouquet, but no marked character.

CHAUCHÉ GRIS.

(See Vit. Rept. 1885–86, p. 101.)

Synonyms: Gray Riesling; Gray D'Ischia (in California).

Description.—A strong, vigorous grower, with abundant foliage; canes thick, with short internodes; leaves of medium size, circular outline, with shallow sinuses or without any, glabrous above, soft-downy below; bunches small, conical, shouldered, compact; berries small, ellipsoidal, from greenish-pink to reddish, with abundant bloom.

This variety has been planted pretty extensively, is vigorous in almost all localities, and generally fairly resistant to disease, except where *oidium* is prevalent, in which places it needs several sulphurings. The vines require long-pruning, but when trained in the usual way the crop is often a total failure, on account of coulure. This tendency to coulure can be overcome by the Guyot system of pruning; the canes tied to the horizontal wires must be very long, and renewed every year. The grapes ripen early, and generally color well; they are very hard and difficult to press. In general, the must is very high in sugar and rather low in acid; it is difficult to ferment, and very slow to clear, especially if it has been allowed to remain for any length of time in contact with the skins.

The localities where this grape has given the most satisfaction are in the higher parts of the Santa Cruz Mountains. Here the sugar content is lower and the acid higher than in the other localities, where it averages 25% of sugar and 0.45% of acid. In favorable localities it gives a wine of good bouquet, clean taste and full body, and produces, when properly pruned, at the rate of 5 to 6 tons per acre. The average crop at Cupertino on the long-pruned vines has been 5.7 tons per acre, while on the short-pruned it has been only 0.4 ton. It has borne well at the Amador station, but in composition the must has been too high in sugar and too low in acid to promise well for a dry wine.

TABLE OF PRODUCTION.

CHAUCHÉ GRIS.	Number of Vines.	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of picking.
1887—No. 694 (long-pruned). J. T. Doyle, Cupertino	20	172	8.6	Oct. 4
No. 707 (short-pruned). J. T. Doyle, Cupertino	20	15	0.7	Oct. 10
1888—No. 882 (long-pruned). J. T. Doyle, Cupertino	20	386	19.3	Oct. 3
No. 883 (short-pruned). J. T. Doyle, Cupertino	20	30	1.5	Oct. 3
1889—No. 1101. J. T. Doyle, Cupertino	20	450	22.5	Sept. 26

CHAUCHÉ GRIS.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric, at Six to Eight Months	WINE. Volatile Acid	WINE. Body	WINE. Ash
1883—No. 92. Charles King, St. Helena		20.94	21.38	.51	.33	10.07	12.54	.68		1.42	.23
No. 92*a*.† Charles King, St. Helena		20.94	21.38	.51	.33	8.91	11.10	‡.63		1.93	.38
No. 93. W. G. Klee, Glenwood		18.96	19.89	.52	.29	9.27	11.54	.60		1.53	.17
No. 93*a*.† W. G. Klee, Glenwood		18.96	19.89	.52	.29	9.05	11.27	§.63		1.73	.25
1884—No 117.* R. Barton, Fresno						9.20	11.45	.66		2.05	.26
1885—No. 359. W. G. Klee, Glenwood		22.80		.41	.28	10.54	13.00	.35		1.80	.25
1886—No. 489. J. T. Doyle, Cupertino		20.90	20.65	.50	.36	8.13	10.17	.55		1.80	
No. 540. J. S. Fowler, Patchen		22.00	21.38	.43	.41	8.77	10.91	.38		1.90	
1887—No. 682. Margherita Vineyard, Fresno	Aug. 29	24.80	24.12	.57	.40	10.81	13.27	.50	.08	2.80	
No. 694 (long-pruned). J. T. Doyle, Cupertino	Oct. 4	25.13	26.31	.50	.39	10.91	13.36	.43		2.50	
No. 707 (short-pruned). J. T. Doyle, Cupertino	Oct. 10	28.78	28.33	.45	.40						
1888—No 839. J. Gallegos, Mission San José	Sept. 10	25.52		.42							
No. 882 (long-pruned). J. T. Doyle, Cupertino	Oct. 3	23.32	23.62	.32	.41	9.70	12.09	.53		2.00	
No. 883 (short-pruned). J. T. Doyle, Cupertino	Oct. 3	24.92	26.00	.29	.49						
1889—No. 1030. Margherita Vineyard, Fresno	Aug. 29	31.10	30.63	.60	.91						
No. 1084. J. Gallegos, Mission San José	Sept. 16	25.90	25.76	.48	.50	10.72	13.18	.37		2.45	
No. 1096. Margherita Vineyard, Fresno	Sept. 16	28.00	27.75	.37	.59	13.15	16.20	.30		3.35	
No. 1101. J. T. Doyle, Cupertino	Sept. 26	25.55		.39							
1890—No. 1207. Margherita Vineyard, Fresno	Aug. 11	22.82	22.67	.48	.50	8.90	11.18	.22		2.15	
No. 1286. J. T. Doyle, Cupertino	Oct. 1	25.44		.36							
1891—No. 1495. Paso Robles	Sept. 13	25.20		.38							
No. 1499. Asti, Sonoma County	Sept. 14	24.80	24.12	.41	.28	9.63	12.00	.44		3.15	
No. 1509. Mission San José	Sept. 24	25.40	25.76	.44		10.63	13.09	.30		2.45	
1892—No. 1649. Paso Robles	Sept. 13	25.20		.45							
No. 1774. Mission San José	Oct. 14	24.80	23.60	.44		9.56	11.91	.60		2.50	
1893—No. 1801. Amador station	Aug. 30	21.30		.72							
No. 1864. Paso Robles	Sept. 13	23.30	22.60	.50	.36	9.05	11.27	.49		2.30	
No. 1987. Mission San José	Oct. 19	25.95	25.19	.52		11.46	14.00	.58		2.60	
No. 2096. Cupertino	Nov. 6	25.20		.36							
1894—No. 2145. Amador station	Sept. 11	25.50		.45							
No. 2240. Mission San José	Oct. 3	25.85		.48							

*Wine sent for examination. †Fermented with skins. ‡Acid at pressing, 0.43%. §Acid at pressing, 0.44%; tannin, 0.035%.

RECORD OF TREATMENT.

No. 682. *Chauché gris*, from Margherita Vineyard, Fresno. Received August 31, 1887, in fair condition. The bunches were large and looser than those from Cupertino; the berries also large and deeply colored. The must showed 24.8% of solid contents by spindle and 0.57% of acid. The temperature of the grapes at crushing was 63°, and the maximum reached was 78°, on the fifth day. The fermentation was slow, and lasted about seventeen days.

At three weeks the wine was drawn off the thick lees. Three months later it was still turbid, and showed indications of secondary fermentation. A microscopic examination of the lees confirmed the indications of the taste, so the wine was racked and pasteurized. A month later it was bright, and had developed some bouquet; it had medium body and adequate acid. The wine as a whole was pleasant and of good quality, except for a rather unpleasant after-taste.

No. 694. *Chauché gris*, from J. T. Doyle, Cupertino. Received October 6, 1887, in good condition. The bunches were well filled, and the berries of good size for the variety, and deeply colored. The must showed 25.13% of solid contents by spindle and 0.50% of acid. The temperature of the grapes at crushing was 71°, and the maximum reached was 88°, on the third day.

At two weeks the wine was drawn off the heavy lees. At two months it was bright, with light acid and aroma, and a fairly well-developed wine. A month later it was racked again; it had developed a little bouquet, but the acid tasted a little sharpish. A microscopic examination of the lees showed some unsound ferments, so the wine was racked again two weeks later, and pasteurized.

No. 707. *Chauché gris*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 11, 1887, in good condition. The grapes were from short-pruned vines, and did not differ materially from those from long-pruned vines. They showed rather more coulure and there were more dried grapes, on account of the hot days immediately preceding their gathering. The must showed 28.78% of solid contents by spindle and 0.45% of acid.

No. 839. *Chauché gris*, from J. Gallegos, Mission San José. A sample for must analysis was received September 12, 1888, in good condition. The must showed 25.52% of solid contents by spindle and 0.42% of acid.

Nos. 882 (long-pruned) and 883 (short-pruned). *Chauché gris*, from J. T. Doyle, Cupertino. Received October 5, 1888, in good condition. The must of the grapes from long-pruned vines showed 23.32% of solid contents by spindle and 0.32% of acid. The grapes from short-pruned vines showed a great deal of coulure, and the must showed 24.92% of solid contents by spindle and 0.29% of acid. The two lots were fermented together. The maximum temperature, reached the fourth day, was 89°. The wine was quite dry on the tenth day, when it was drawn off the thick lees.

At three months the wine was not quite clear, but showed good aroma. Two months later it was pasteurized, on account of the presence of small quantities of unsound ferments in the lees. At eleven months it was clear and of fair quality, but with a slightly suspicious odor. At seventeen months it had deteriorated and become slightly bitter. It was racked again at this time, but did not improve.

No. 1030. *Chauché gris*, from Margherita Vineyard, Fresno. A sample for must analysis was received September 2, 1889, in good condition. The must showed 31.1% of solid contents by spindle and 0.60% of acid.

No. 1084. *Chauché gris*, from J. Gallegos, Mission San José. Received September 19, 1889, in good condition, and completely mature. The must showed 25.9% of solid contents by spindle and 0.48% of acid. The maximum temperature reached by the fermenting must was 83°, on the third day. The wine was dry on the sixth day.

At one month the wine was almost clear, clean-tasting, and with pleasing aroma. Eight days later it was clear, and in two weeks was taken to the cellar. At four months it was clear, of light golden color, with marked and agreeable aroma, rather raw still, but of good general quality. At seven months it was racked for the third time. It became cloudy, and showed signs of secondary fermentation, so it was submitted to electrical treatment for an hour. Two months later the wine tasted exhausted, and had evidently not been benefited by the treatment, as it steadily deteriorated after this.

No. 1096. *Chauché gris*, from Margherita Vineyard, Fresno. Received September 20, 1889, in good condition, but overripe. The bunches were larger and looser than usual; the berries softer and more juicy than those of the same variety from Mission San José. The skin was almost rose-colored. The must showed 28.0% of solid contents by spindle and 0.37% of acid. The fermentation reached its maximum on the third day at a temperature of 79.5°. The wine was nearly dry on the fifth day.

At one month the wine was racked and taken to the cellar. It was bright, of light golden-yellow color, of faint flavor and aroma, full body, medium acid, and good general quality. At four months it was bright, full-bodied, and rather rough for a white wine. Three months later it was pasteurized, as the lees showed signs of unsound ferments. There were traces of sugar in the wine, which started the secondary ferments again later, so that the wine did not improve. At one year the wine, which had been

kept in demijohn since it was pasteurized, was fairly good, but the wine in the keg was bitter. After this it did not improve.

No. 1101. *Chauché gris*, from J. T. Doyle, Cupertino. A sample for must analysis was received September 27, 1889, in good condition, and quite ripe. The bunches were of medium size, cylindrical, sometimes shouldered, close; the berries of normal size, firm and not juicy, sweet and agreeable. The must showed 25.55% of solid contents by spindle and 0.39% of acid.

No. 1207. *Chauché gris*, from Margherita Vineyard, Fresno. Received August 14, 1890, in fairly good condition. Bunches compact and of fair size; berries firm, and completely mature. The must showed 22.82% of solid contents by spindle, and reached its maximum temperature of 79° on the fourth day; the fermentation was slow and prolonged.

Six weeks after crushing the wine was nearly clear, but still a little sweet and fermenting. At ten weeks the wine was quite clear, with pleasing but neutral flavor, good body and alcohol, medium acid, but no bouquet. It was racked four times the first year, but after six months commenced to deteriorate, becoming flat and insipid. At fourteen months it was bottled, but failed to keep in glass.

No. 1286. *Chauché gris*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 3, 1890, in fair condition; a few grapes moldy, quite ripe. The must showed 25.43% of solid contents by spindle.

No. 1495. *Chauché gris*, from Paso Robles station. A sample for must analysis arrived September 16, 1891, in good condition. The grapes were mature and very small. The must showed 25.2% of solid contents by spindle.

No. 1499. *Chauché gris*, from Asti, Sonoma County. Received September 17, 1891, in good condition, well-colored, and mature. The must showed 24.8% of solid contents by spindle. The fermentation was very feeble and slow, the must never rising more than 2° above the temperature of the room.

At the end of a month the wine was still sweet and fermentation had almost stopped; it was then treated with half a gallon of sediment from No. 1601, a White Vernaccia from Cupertino in full fermentation, and then aërated. Fermentation recommenced, and in four days the wine was almost dry. It never became quite clear, and at four months commenced to show signs of bad acid, and was therefore pasteurized. At six months it was racked, and at eight months it was quite bright, though still a little sweet. At ten months it was racked and lightly sulphured. At fourteen months it was bright, still slightly sweet, but quite sound and fairly agreeable. At fifteen months it was bottled.

No. 1509. *Chauché gris*, from Mission San José. Received September 27, 1891, in fair condition; a little moldy. The must showed 25.4% of solid contents by spindle. The must went through promptly in five days, reaching its maximum temperature of 81° on the third day.

The wine was a little slow in clearing, but was clear two months after crushing. It was racked twice during the first three months, and at the end of that time was bright, of fair quality, but slightly bitter. Eight months after crushing it was much improved, smooth, full-bodied, and pleasing. At fifteen months the wine had not developed much bouquet, but was mature, and was bottled.

No. 1649. *Chauché gris*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 25.2% of solid contents by spindle.

No. 1774. *Chauché gris*, from Mission San José. Received October 15, 1892, in good condition. The must showed 24.8% of solid contents by spindle. The fermentation reached its maximum temperature of 82° on the fourth day, and continued slowly for some time, and was slow in clearing.

The wine was racked twice during the first two months, and at three months was bright, had full flavor and a little bouquet, but was not quite clean-tasting. Tastings at five, eight, and ten months showed a gradual improvement and a quick maturing. At eighteen months the wine was bottled.

No. 1801. *Chauché gris*, from Amador station. A sample for must analysis was received September 1, 1893, in good condition. The bunches were small and well filled. The must showed 21.3% of solid contents by spindle.

No. 1864. *Chauché gris*, from Paso Robles station. Received September 15, 1893, in good condition. The bunches were very compact and large; the berries were large for the variety, unevenly ripened. The must showed 23.3% of solid contents by spindle. The must reached its maximum temperature of 82° on the fourth day, and fermented through in seven days.

The wine cleared in three weeks, and was racked twice during the first month. At four months it was bright, full-bodied, with a little flavor and bouquet, but still very raw. At eight months it was much improved, had acquired a good bouquet, a clean, sound after-taste, and was altogether an agreeable wine.

No. 1987. *Chauché gris*, from Mission San José. Received October 19, 1893, in good condition, very ripe, and more deeply colored than usual. The must showed 25.95% of

solid contents by spindle. The must fermented slowly, and did not attain its maximum temperature of 81° until the fourth day; in eight days it was nearly dry.

At one month the wine was nearly clear, and was racked for the second time. At three months it was bright, but very raw. At seven months it was smoother, full-bodied, but quite clean-tasting.

No. 2096. *Chauché gris*, from J. T. Doyle, Cupertino. A sample for must analysis arrived November 6, 1893, in good condition. The bunches were small and compact; the berries small, deeply colored, overripe, but with good acid. The must showed 25.2% of solid contents by spindle.

BURGER.

(See Vit. Rept. 1883–85, p. 124; 1885–86, p. 93.)

Synonyms: White Tokay; Putszcheere; Elender.

The Burger, properly so called, is a grape of the northern part of the wine belt of Europe, and the grape passing under that name in California has been associated, both in the vineyards and cellars, with the (true) Riesling, the Gutedel or Chasselas, and other Rhenish grapes. Among these, it is in Europe held in but very light estimation as to quality, though known to produce large quantities of a light acid wine, poor in alcohol. Among its names is that of White Elbling; the Blue Elbling, largely cultivated by Mr. L. J. Rose at San Gabriel, being held to be one of its varieties.

However similar to the true Burger, or Kleinberger, in respect to the wine it yields, especially in northern localities, the California grape differs from the German type as well as from the Blue Elbling. From a comparison with a grape imported by Mr. Groezinger, Mr. Wetmore identifies our grape with the White Tokay, also known as Putszcheere, and Elender; both names indicative of no very high estimate of the variety, which seems to represent the Burger in Hungary.

This variety has been so extensively planted and is so well known in California that an extended description is unnecessary. It succeeds well in all localities which are not too late to ripen its grapes, bearing immense crops where the soil is rich, and good crops wherever vines will thrive at all.

Description.—Vine rather a small grower; leaves of medium size or smaller, the lateral sinuses well marked, often closed, the petiolar sinus narrow, dentation very obtuse, sometimes almost sinuate; the upper surface of leaves glabrous, the lower sparsely downy; bunch very large, irregular, generally very compact; berries a little over medium size, round, very juicy, and without special flavor.

The skin of the grapes is very easily broken, rendering them susceptible to damage by early rains. In the northern coast counties the variety produces a light acid wine of fair quality when planted in a warm and early location, but the best results have been obtained with it in the warmer southern and central counties. In Fresno and Tulare counties it attains very regularly from 20% to 23% of sugar, with from 0.6% to 0.4% of acid, ferments well, and produces one of the best white wines of those localities. In San Luis Obispo County it has also done well, retaining good acid with a fair amount of sugar. In the Sierra foothills it has not been so satisfactory; and in the northern coast counties it is too much at the mercy of early autumn rains and late seasons; for, though a clean, neutral wine of good keeping qualities is sometimes obtained from it, at other times, and more often, it gives a thin, watery, green-tasting wine, good only for distillation.

The crops reported as obtained from this variety vary from 2 tons (exceptionally small) in a red hill soil of Napa County, to 11 tons or more in rich soils. About 7 tons to the acre would seem to be about the average in ordinary soils. The average for three years at Cupertino has been 9.3 tons per acre.

Burger is preëminently a blending wine, especially useful as an addition to such wines as the Chauché gris, which it improves in acid and keeping qualities; it is also, on account of its neutral character, of use as a toning-down blend with wines of too strongly marked character, being often used as a diluent with red wines too rich in color, tannin, or special flavor. One of its especial merits is the ease with which it maintains and imparts to other musts a sound fermentation.

TABLE OF PRODUCTION.

BURGER.	Number of Vines	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking
1887—No. 748 (long-pruned). J. T. Doyle, Cupertino	20	535	26.7	Oct. 18
No. 754 (short-pruned). J. T. Doyle, Cupertino	20	445	22.2	Oct. 19
1888—No. 940 (short-pruned). J. T. Doyle, Cupertino	20	720	36.0	Oct. 25
No. 941 (long-pruned). J. T. Doyle, Cupertino	20	515	25.7	Oct. 25
1889—No. 1165. J. T. Doyle, Cupertino	20	500	25.0	Oct. 14

	BURGER.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric, at six to Eight Months	WINE. Volatile Acid	WINE. Body	WINE. Ash
1883—No. 112.*	R. Barton, Fresno						9.12	11.36	.49		2.24	.37
1884—No. 113.*	R. Barton, Fresno						8.98	11.17	.50		3.02	.26
No. 261.	R. Barton, Fresno		20.06	19.96	.45	.45	8.55	10.63	.53		1.65	.18
No. 114.*	L. J. Rose, San Gabriel						9.20	11.42	.40		2.16	.31
No. 261.	Stern & Rose, San Gabriel		19.19	19.15	.54	.31	8.41	10.50	.60		2.05	.26
1885—No. 348.	Leland Stanford, Vina		23.35		.59	.60	9.63	12.06	.68		2.69	.45
No. 349.	C. Weller, Harrisburg		19.46		.80	.30	8.13	10.16	.65		1.93	.19
No. 362.	H. Keatinge, Lower Lake		22.69		.47	.40	8.84	11.00	.54		1.68	.18
No. 366.	D. C. Feeley, Patchen		12.62		.75	.32	4.76	6.00	.48		1.52	.23
1886—No. 471.	Leland Stanford, Vina	Sept. 16	22.50		.50	.48	8.20	10.25	.75		1.80	
No. 501.	J. T. Doyle, Cupertino	Sept. 27	13.10	11.68	1.02	.09	3.96	5.00	.79		1.30	
No. 508.	R. Wegener, Livermore	Sept. 28	20.80	20.24	.44	.37	7.92	9.90	.40		2.05	
No. 572.†	J. D. Cone, Sacramento		24.00	24.33	.39	.39						
1887—No. 748	(long-pruned). J. T. Doyle, Cupertino	Oct. 18	19.40	19.21	.65	.33	7.90	9.90	.54	.07	2.10	
No. 754	(short-pruned). J. T. Doyle, Cupertino	Oct. 19	21.98	21.63	.81	.37	9.20	11.45	.66	.03	2.30	
No. 692.*	R. Wegener, Livermore	Sept. 28	22.87	22.67	.62	.42	8.98	11.18	.50	.02	2.30	
No. 681.	Margherita Vineyard, Fresno	Aug. 28	23.24	22.67	.45	.53	9.92	12.36	.50	.11	2.60	
1888—No. 830.	Margherita Vineyard, Fresno	Sept. 5	23.16	24.11	.34	.60	9.27	11.55	.58		2.10	
No. 940	(short-pruned). J. T. Doyle, Cupertino	Oct. 25	19.13	19.75	.31	.39						
No. 941	(long-pruned). J. T. Doyle, Cupertino	Oct. 25	19.30	19.54	.63	.45	7.64	9.54	.55		1.40	
1889—No. 1165.	J. T. Doyle, Cupertino	Oct. 14	20.10		.63							
No. 1173.	J. Gallegos, Mission San José	Oct. 15	21.20	21.55	.47	.32	8.34	10.42	.43		2.35	
1890—No. 1279.	J. T. Doyle, Cupertino	Sept. 29	19.30		.87							
No. 1383.	J. Gallegos, Mission San José	Oct. 17	20.20		.68	.34	9.20	11.45	.50		2.44	
1891—No. 1449.	Tulare	Aug. 26	21.50		.53							
No. 1539.	Paso Robles	Oct. 6	23.70		.45							
No. 1565.	Mission San José	Oct. 6	20.60		.68		8.17	10.91	.62		2.30	
1892—No. 1644.	Paso Robles	Sept. 14	19.05		.80							
No. 1660.	Amador station	Sept. 16	21.10		.60							
No. 1667.	Tulare	Sept. 16	19.60		.56	.36	7.78	9.73	.51		2.35	
No. 1773.	Mission San José	Oct. 13	20.70	19.21	.79		8.84	11.00	.55		2.20	

1893—No. 1839.	Amador station	Sept. 6	15.20	.....	.91	.....	.....	.....	.....	.....	.....	.....
No. 1861.	Amador station	Sept. 13	17.70	.....	.90	.....	.....	.....	.....	.....	.....	.....
No. 1908.	Tulare	Oct. 3	20.00	19.21	.75	.44	7.75	9.70	.45	.....	2.60	.....
No. 2008.	Paso Robles	Oct. 25	22.05	21.40	.45	.39	8.84	11.00	.45	.....	2.30	.....
No. 2061.	Mission San José	Nov. 1	22.60	21.63	.79	.23	9.34	11.64	.71	.....	2.15	.....
No. 2085.	Cupertino	Nov. 6	17.20	.....	.99	.....	.....	.....	.....	.....	.....	.....
No. 2190.	Amador station	Sept. 25	24.35	.....	.38	.....	.....	.....	.....	.....	.....	.....
No. 2217.	Paso Robles	Sept. 28	22.80	.....	.68	.....	.....	.....	.....	.....	.....	.....
No. 2241.	Mission San José	Oct. 5	18.80	.....	.69	.....	.....	.....	.....	.....	.....	.....
No. 2315.	Amador station	Oct. 15	25.40	.....	.41	.....	.....	.....	.....	.....	.....	.....
No. 2333.	Tulare	Oct. 19	21.90	20.10	.55	.....	8.13	10.17	.39	.....	2.45	.....

* Wines sent for examination. † Condensed must.

RECORD OF TREATMENT.

No. 681. *Burger*, from Margherita Vineyard, Fresno. Received August 31, 1887, in good condition. The bunches were large, well filled, and without coulure; the berries were large, thick-skinned, and with good acid. The must showed 23.24% of solid contents by spindle and 0.45% of acid. The temperature of the grapes at crushing was 69°, and the maximum reached was 78°, on the fifth day. The wine was dry on the tenth day, and was drawn off.

At three weeks the wine was drawn off the thick lees, and a month later it was clear, with some aroma and pleasing quality. At three months an examination of the lees showed them not to be quite sound, so the wine was drawn off and pasteurized. At nine months the wine was bright, and had developed some bouquet, but was not quite clean-tasting. At this time it was racked again.

No. 692. *Burger*, from R. Wegener, Livermore. Received October 1, 1887, in good condition. But few of the bunches were compact, many of them showing coulure; the berries were generally small, and very sweet. The must showed 22.87% of solid contents by spindle and 0.62% of acid. The temperature of the grapes at crushing was 73°, and the maximum reached was 86°, on the eighth day. The fermentation was complete on the thirteenth day, when the wine was drawn off.

At three months the wine was bright, and showed better aroma but less body than No. 681, the Fresno sample. Two weeks later it was racked again. At seven months, as the lees showed some unsound germs, the wine was drawn off and pasteurized. At eight months it was bright, light-bodied, with some bouquet, but flat and neutral, and generally inferior to the Fresno sample.

No. 748. *Burger*, from J. T. Doyle, Cupertino. Received October 19, 1887, in good condition. The grapes were from long-pruned vines. The bunches were large, well filled, and showed no coulure; the berries were sweet, thin-skinned, and many bronzed by the sun. The must showed 19.4% of solid contents by spindle and 0.65% of acid. The temperature of the grapes at crushing was 61°, and the maximum reached was 83°, on the second day.

In sixteen days the wine was drawn off the lees, and at seven weeks it was clear, with medium acid, but watery and without aroma. Two weeks later it was racked again. At six months the sediment showed unsound ferments, and was racked off and pasteurized. At eight months the wine was bright and very much improved; it had developed some bouquet, and was a good wine for a Burger.

No. 754. *Burger*, from J. T. Doyle, Cupertino. Received October 20, 1887, in good condition. The grapes were from short-pruned vines. The bunches were of extremely large size; the berries very large, juicy, and much more agreeably flavored than the grapes from long-pruned vines. The must showed 21.98% of solid contents by spindle and 0.81% of acid. The temperature of the grapes at crushing was 71°, and the maximum reached was 86°, on the third day. In two weeks the wine was quite dry, and was drawn from the lees.

At two months the wine was clear, with fair aroma, medium acid, somewhat thin, but of fair quality Ten weeks later it had a suspicious taste, so it was drawn off and pasteurized. At eight months it was bright, with well-developed bouquet, of fair body, and slightly sharp acid.

No. 830. *Burger*, from Margherita Vineyard, Fresno. Received September 8, 1888, in excellent condition. The bunches were large and full; the berries juicy and very sweet, with moderately thick and rather tough skin. The must showed 23.16% of solid contents by spindle and 0.34% of acid. The temperature of the grapes at crushing was 69°, and the maximum reached was 81.5°, on the sixth day. On the twelfth day the fermentation was over, and the wine was drawn off.

At seven weeks the wine was racked again and taken to the cellar. At four months the wine was not clear, but it tasted good. Two months later it was racked again, and an examination of the lees showed no unsound germs. After this the wine did not improve much, but became clear. At seventeen months it was bright, and showed some bouquet; after this it deteriorated. At twenty-three months it was put in glass. At twenty-nine months the wine bottled at fifteen months was not quite bright, and was of poor quality; that bottled at twenty-three months was bright, and of better quality. The former did not improve in glass, but the latter nineteen months later was of fair quality, sound, bright, and drinkable.

No. 940. *Burger*, from J. T. Doyle, Cupertino. Received October 26, 1888, in good condition. The grapes were partly from long-pruned and partly from short-pruned vines. Those from the short-pruned vines were the best and showed the less coulure. The must showed 19.13% of solid contents by spindle and 0.31% of acid for the short-pruned, and 19.3% of solid contents by spindle and 0.63% of acid for the long-pruned. The temperature of the grapes at crushing was 67°, and the maximum reached was 83.5°, on the second day. On the tenth day the fermentation was over, and the wine was drawn off.

At two months the wine was clear, of somewhat better aroma than the Burger from Fresno, but light and thin. Two months later an examination of the lees showed them to be sound. At eleven months the wine was in good condition, and rather agreeable. Six months later the lees showed many old bitter ferments; the wine was bright, but had a slightly bitter flavor and had deteriorated since the last tasting; it was racked and

part put in bottle. At twenty-two months the lees showed no bad germs; the wine was in good condition, of agreeable flavor, medium acid, poor aroma, fair quality, and mature. A month later it was put in bottle. At two years and four months the wine bottled at seventeen months was bright, with light deposit in bottle, no bouquet, little flavor, rather fresh, and agreeable. That bottled at twenty-three months was bright, but tasted as if exhausted, and lacked the freshness of the other.

No. 1165. *Burger*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 15, 1889, in fair condition. The bunches were large, cylindrical, compact; the berries over average in size, irregular, soft, juicy, and watery-tasting. The must showed 20.1% of solid contents by spindle and 0.63% of acid.

No. 1173. *Burger*, from Mission San José. Received October 16, 1889, in fair condition. The bunches were large and very compact, maturity complete. The must showed 21.2% of solid contents by spindle and 0.47% of acid. The temperature of the grapes at crushing was 63.5°, and the maximum reached was 81.5°, on the third day. On the fifth day the wine was drawn off, being quite dry.

At two months the wine was not quite clear; it showed medium acidity and body, fair quality, but was lacking in flavor and aroma. At this time it was racked for the second time and taken to the cellar. Six weeks later it had improved very much; it was bright, but lacked character. Four months later it showed signs of unsoundness, and was pasteurized. Tastings at eight and at ten months showed improvement and the development of some bouquet. After this the wine deteriorated, and showed that it had attained its maturity at from ten to twelve months.

No. 1279. *Burger*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 2, 1890, in good condition. The bunches and grapes were large and fine, but the latter were not quite ripe. The must showed 19.3% of solid contents by spindle.

No. 1383. *Burger*, from Mission San José. Received October 20, 1890, in a somewhat bruised condition and a little moldy. The must showed 20.2% of solid contents by spindle. The fermentation lasted seven days, with a maximum temperature of 80° on the fourth day.

The wine was racked twice during the first month, but did not clear very quickly. At one month it was a light, pleasant wine, but not quite clear, and with a slight taste of mold. The lees were examined at intervals, but no unsound germs were found. At three months the wine was clear, and was racked; it had a light, pleasant bouquet, somewhat disguised by moldiness. At eighteen months the wine tasted mature, so part was bottled, the remainder being bottled at two years. Fourteen months after the second bottling, both samples were tasted; they were both bright, and the second a very agreeable wine, but lacking in bouquet; the first was not quite clean-tasting.

No. 1449. *Burger*, from Tulare station. A sample for must analysis arrived August 29, 1891, in good condition, but not mature. The must showed 21.5% of solid contents by spindle.

No. 1539. *Burger*, from Paso Robles station. A sample for must analysis was received October 8, 1891, in good condition. The bunches were of medium size, well filled, with medium-sized berries. The must showed 23.7% of solid contents by spindle.

No. 1565. *Burger*, from Mission San José. Received October 9, 1891, in fair condition. The must showed 20.6% of solid contents by spindle. The fermentation was slow and cool, lasting ten days, and remaining at its maximum temperature of 77° from the fourth to the sixth day.

In six weeks the wine was clear and clean-tasting. It was racked twice during the first three months, and at five months was bright, without much bouquet or flavor, but clean-tasting and with full and agreeable acid. At eight months it was smooth and pleasing, and had developed well. At fifteen months it was mature, in good order, a very pleasing wine, but with little character; at this age it was bottled.

No. 1644. *Burger*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 19.05% of solid contents by spindle.

No. 1660. *Burger*, from Amador station. A sample for must analysis was received September 19, 1892, in poor condition. The must showed 21.1% of solid contents by spindle.

No. 1667. *Burger*, from Tulare station. A very fine lot of grapes was received September 19, 1892, in good condition. The must showed 19.6% of solid contents by spindle. The must fermented well and reached its maximum temperature of 80° on the fourth day.

In one month the wine was dry, clear, and clean-tasting; it was racked twice during the first two months. At four months the wine was bright, smooth, and fresh-tasting, but lacking in bouquet. At nine months the wine was in good order, and, though lacking in delicacy, the best of the Tulare white wines of this year. After this the wine deteriorated.

No. 1773. *Burger*, from Mission San José. Received October 15, 1892. The must showed 20.7% of solid contents by spindle. The fermentation was rather slow in starting,

as the grapes were crushed at 58°; it reached its maximum temperature of 79° on the fourth day, and continued about eleven days, when the wine was nearly dry.

In three weeks the wine was nearly clear and quite dry; it was racked twice during the first two months, and at three months was bright, clean-tasting, and with full acid. Tastings at five, eight, ten, and thirteen months showed a gradual improvement and the development of a little bouquet. The wine kept well, and while lacking in character was clean-tasting and pleasant.

No. 1839. *Burger*, from Amador station. Received September 8, 1893, in good condition. The grapes were generally of good size, but some bunches had many abortive berries; they were not mature. The must showed 15.2% of solid contents by spindle.

No. 1861. *Burger*, from Amador station. Another sample for must analysis arrived September 15, 1893, in good condition, but not mature. The bunches were large, and the berries very irregular in size. The must showed 17.7% of solid contents by spindle.

No. 1908. *Burger*, from Tulare station. Received October 5, 1893, in good condition, except for a few moldy bunches. The bunches and berries were very large and well ripened. The must showed 20.0% of solid contents by spindle. The fermentation was quick and thorough, reached its maximum temperature of 89° on the third day, and was through on the fifth.

At the end of the first month the wine was nearly clear, dry, and clean-tasting. Tastings at four, six, and eight months showed a general toning-down and increase of brightness, but the wine was completely neutral and almost without flavor or bouquet.

No. 2008. *Burger*, from Paso Robles station. Received October 26, 1893, in good condition. The bunches were large, irregular, loose, but well filled; the berries a little over medium in size. The grapes were quite mature. The must showed 22.05% of solid contents by spindle. The fermentation lasted nine days, and was cool, the temperature never going above 75°.

The wine cleared quickly, and was racked twice during the first two months. At seven months the wine was bright, clean-tasting, with moderate acid and neutral flavor.

No. 2061. *Burger*, from Mission San José. Received November 1, 1893, in good condition, and mature. The must showed 22.6% of solid contents by spindle. The fermentation was slow and cool, reaching its maximum temperature of 78° on the fourth day.

The wine became bright soon after the first racking, and at three months after crushing was a clean-tasting, neutral wine, with full acid.

No. 2085. *Burger*, from J. T. Doyle, Cupertino. A sample for must analysis arrived November 6, 1893, in good condition. The must showed 17.2% of solid contents by spindle.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF WHITE SOUTHERN FRENCH TYPE.

Number.	LOCALITY.	Vintage of	MUST.			WINE.			
			Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol by Volume.	Total Acid as Tartaric, at Six to Eight Months.	Body.
	Clairette blanche.								
264	Natoma	1884	21.34	21.07	.45	.31	13.00	.43	1.85
481	Mission San José	1886	17.50	17.22	.53	.28	8.85	.55	2.10
510	Mission San José	1886	20.00	.....	.87	.....	.....	.....	.....
513	Mission San José	1886	19.30	.....	.56	.....	8.61	.47	1.58
535	Mission San José	1886	21.50	20.76	.86	.36	10.00	.51	1.80
535*a*	Mission San José	1886	21.50	20.76	.86	.36	9.82	.57	1.92
771	Mission San José	1887	25.45	25.20	.45	.35	12.36	.61	2.20
948	Mission San José	1888	23.32	22.22	.26	.28	11.27	.55	1.80
1170	Mission San José	1889	22.40	22.67	.41	.35	11.55	.40	2.55
1420	Mission San José	1890	26.30	.....	.54	.21	13.27	.42	2.78
2065	Mission San José	1893	24.80	.....	.54	.....	.....	.....	.....
2225	Mission San José	1894	20.60	19.21	.62	.....	.....	.64	.....
2345	Mission San José	1894	20.85	.....	.39	.....	.....	.....	.....
1196	Cupertino	1889	18.15	17.17	.34	.45	8.70	.42	1.35
1398	Cupertino	1890	21.10	.....	.53	.....	.....	.....	.....
2029	Cupertino	1893	22.40	.....	.50	.....	.....	.....	.....
1543	Paso Robles	1891	24.80	.....	.45	.....	.....	.....	.....
1748	Paso Robles	1892	22.20	.....	.32	.....	.....	.....	.....

SUMMARY OF ANALYSES OF MUSTS AND WINES OF WHITE SOUTHERN FRENCH TYPE—Cont'd.

Number	LOCALITY.	Vintage of	MUST.				WINE.			
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Total Acid as Tartaric, at Six to Eight Months	Body
	Clarette blanche—Cont.								
1658	Amador station	1892	22.70		.46				
1838	Amador station	1893	18.00		.71				
1862	Amador station	1893	21.70		.56				
2192	Amador station	1894	24.15		.39				
1701	Tulare	1892	22.40		.29				
1969	Tulare	1893	22.90	21.38	.38	.30	11.45	.53	2.20
2339	Tulare	1894	25.00		.34				
	Average, Mission San Jose		**22.05**	**21.15**	**.57**	**.31**	**10.71**	**.52**	**2.09**
	Average, Cupertino		**20.55**	**17.17**	**.45**	**.45**	**8.70**	**.42**	**1.35**
	Average, Paso Robles		**23.50**		**.38**				
	Average, Amador station		**21.64**		**.53**				
	Average, Tulare		**23.43**	**21.38**	**.33**	**.30**	**11.45**	**.53**	**2.20**
	Marsanne.								
1412	Cupertino	1890	24.10		.66	.27	12.82	.50	2.50
2097	Cupertino	1893	25.90		.63				
1619	Tulare	1892	25.65	23.67	.38	.45	*22.18	.43	3.66
2000	Tulare	1893	26.10	25.76	.41	.50	12.73	.43	2.90
2203	Tulare	1894	27.35		.26				
1856	Amador station	1893	23.70		.48				
2162	Amador station	1894	26.70		.34				
1960	Paso Robles	1893	24.10		.24				
	Average, Cupertino		**25.00**		**.64**	**.27**	**12.82**	**.50**	**2.50**
	Average, Tulare			**24.71**	**.35**	**.47**	**12.73**	**.43**	**2.90**
	Average, Amador station		**25.20**		**.41**				
	Chasselas doré.								
476	Cupertino	1886	17.50		.40	.25	8.61	.41	
696	Cupertino	1887	23.17	23.61	.31	.33	11.64	.53	1.87
917	Cupertino. (Short-pruned)	1888	22.89	24.12	.20	.50	11.45	.38	2.25
918	Cupertino. (Long-pruned)	1888	22.24	22.67	.22	.33			
1267	Cupertino	1890	22.30		.44	.29			
2086	Cupertino	1893	23.10		.53				
1112	Mission San José	1889	22.60	21.80	.25	.38	11.45	.28	2.28
1260	Mission San José	1890	21.93		.40	.26			
1561	Mission San José	1891	22.15		.40		11.45	.39	1.80
1776	Mission San José	1892	20.85	21.38	.37		11.00	.53	2.10
1948	Mission San José	1893	23.70		.46				
2247	Mission San José	1894	21.90		.35				
1448	Tulare	1891	24.53		.18				
1677	Tulare	1892	20.20		.29		9.90	.40	2.70
2324	Tulare	1894	22.15		.21				
	Average, Cupertino			**23.46**	**.34**	**.36**	**11.54**	**.45**	**2.06**
	Average, Mission San Jose		**22.19**	**21.59**	**.37**	**.32**	**11.30**	**.40**	**2.06**
	Average, Tulare		**22.29**		**.23**		**9.90**	**.40**	**2.70**
	Ugni blanc.								
274	Natoma	1884	20.70	20.61	.59	.49	11.10	.51	2.00
785	Cupertino	1887	21.46	20.99	.87	.47	9.63	.56	2.60
964	Cupertino	1888	19.75	20.03	.50	.37	9.73	.45	2.30
1195	Cupertino	1889	22.80	21.80	.51	.29	11.45	.39	2.00
1405	Cupertino	1890	23.05		.91	.34	11.27	.74	1.54
2026	Cupertino	1893	22.40		1.00				
1704	Tulare	1892	22.15		.45				
2352	Tulare	1894	23.30		.36				
1737	Paso Robles	1892	24.20		.51				
	Average, Cupertino		**21.89**	**20.94**	**.76**	**.36**	**10.52**	**.53**	**2.11**
	Average, Tulare		**22.72**		**.40**				

*Fortified.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF WHITE SOUTHERN FRENCH TYPE—Cont'd.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Total Acid as Tartaric, at Six to Eight Months	WINE. Body
	Verdal.								
367	Patchen	1885	14.91	.....	.53	.26	8.07	.52	1.80
585	Patchen	1886	17.00	15.11	.63	.47	8.46	.55	1.55
512	Livermore	1886	21.80	21.07	.38	.30	10.36	.41	1.80
701	Livermore	1887	22.84	23.22	.52	.37	10.75	.43	2.60
803	Glenwood	1887	20.65	20.10	.75	.40	.....	.....	.....
1164	Cupertino	1889	21.50	.....	.48	.....	.....	.....	.....
1361	Cupertino	1890	18.95	.....	.84	.22	9.73	.46	1.80
1188	Mission San José	1889	19.50	.....	.57	.....	.....	.....	.....
1430	Mission San José	1890	22.15	.....	.63	.....	.....	.....	.....
2233	Mission San José	1894	20.40	.....	.53	.....	.....	.....	.....
1453	Tulare	1891	18.82	18.30	.53	.....	8.07	.40	2.60
1705	Tulare	1892	20.40	19.75	.42	.43	11.00	.46	2.30
1912	Tulare	1893	18.80	17.70	.75	.39	9.27	.48	2.60
1982	Tulare	1893	19.50	18.46	.58	.25	9.54	.45	2.60
2342	Tulare	1894	19.30	17.99	.59	.....	.....	.....	.....
1964	Paso Robles	1893	22.85	.....	.52	.....	.....	.....	.....
2082	Paso Robles	1893	22.70	21.63	.51	.37	10.12	.51	2.25
	Average, Patchen	.....	**15.95**	**15.11**	**.58**	**.36**	**8.25**	**.53**	**1.67**
	Average, Livermore	.....	**22.32**	**22.14**	**.45**	**.33**	**10.55**	**.42**	**2.20**
	Average, Cupertino	.....	**20.22**	.....	**.66**	**.22**	**9.73**	**.46**	**1.80**
	Average, Mission San Jose	.....	**20.68**	.....	**.57**	.....	.....	.....	.....
	Average, Tulare	.....	**19.32**	**18.44**	**.57**	**.35**	**9.47**	**.47**	**2.52**
	Average, Paso Robles	.....	**22.77**	**21.63**	**.51**	**.37**	**10.12**	**.51**	**2.25**
	Chauché gris.								
92	St. Helena	1883	20.94	21.38	.51	.33	12.54	.68	1.42
93	Glenwood	1883	18.96	19.89	.52	.29	11.54	.60	1.53
359	Glenwood	1885	22.80	.....	.41	.28	13.00	.35	1.80
117	Fresno	1884	.....	.....	.....	.....	11.45	.66	2.05
682	Fresno	1887	24.80	24.12	.57	.40	13.27	.50	2.80
1030	Fresno	1889	31.10	30.63	.60	.91	.....	.....	.....
1096	Fresno	1889	28.00	27.75	.37	.59	16.20	.30	3.35
1207	Fresno	1890	22.82	22.67	.48	.50	11.18	.22	2.15
489	Cupertino	1886	20.90	20.65	.50	.36	10 17	.55	1.80
694	Cupertino. (Long-pruned)	1887	25.13	26.31	.50	.39	13.36	.43	2.50
707	Cupertino. (Short-pruned)	1887	28.78	28.33	.45	.40	.....	.....	.....
882	Cupertino. (Long-pruned)	1887	23 32	23.62	.32	.41	12.09	.53	2.00
883	Cupertino. (Short-pruned)	1888	24.92	26.00	.29	.49			
1101	Cupertino	1889	25.55	.....	.39	.....	.....	.....	.....
1286	Cupertino	1890	25.44	.....	.36	.....	.....	.....	.....
2096	Cupertino	1893	25.20	.....	.36	.....	.....	.....	.....
540	Patchen	1886	22.00	21.38	.43	.41	10.91	.38	1.90
839	Mission San José	1887	25.52	.....	.42	.....	.....	.....	.....
1084	Mission San José	1889	25.90	25.76	.48	.50	13.18	.37	2.45
1509	Mission San José	1891	25.40	25.76	.44	.....	13 09	.30	2.45
1774	Mission San José	1892	24.80	23.60	.44	.....	11.91	.60	2 50
1987	Mission San José	1893	25.95	25.19	.52	.....	14.00	.58	2.60
2240	Mission San José	1894	25.85	.....	.48	.....	.....	.....	.....
1499	Asti, Sonoma County	1891	24.80	24.12	.41	.28	.....	.....	.....
1495	Paso Robles	1891	25.20	.....	.38	.....	.....	.....	.....
1649	Paso Robles	1892	25.20	.....	.45	.....	.....	.....	.....
1864	Paso Robles	1893	23.30	22.60	.50	.36	11.27	.49	2.30
1801	Amador station	1893	21.30	.....	.72	.....	.....	.....	.....
2145	Amador station	1894	25.50	.....	.45	.....	.....	.....	.....
	Average, Glenwood	.....	**20.88**	**19.89**	**.46**	**.28**	**12.27**	**.47**	**1.67**
	Average, Fresno	.....	**26.68**	**26.29**	**.50**	**.60**	**13.02**	**.42**	**2.59**
	Average, Cupertino	.....	.....	**24 98**	**.39**	**.41**	**11.87**	**.50**	**2.10**
	Average, Mission San Jose	.....	**25.59**	**25.08**	**.48**	**.50**	**13.04**	**.46**	**2.50**
	Average, Paso Robles	.....	**24.57**	**22.60**	**.44**	**.36**	**11.27**	**.49**	**2.30**

SUMMARY OF ANALYSES OF MUSTS AND WINES OF WHITE SOUTHERN FRENCH TYPE—Cont'd.

Number	LOCALITY.	Vintage of	MUST.				WINE.		
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Total Acid as Tartaric, at Six to Eight Mos.	Body
	Burger.								
112	Fresno	1883					11.36	.49	2.24
113	Fresno	1884					11.17	.50	3.02
261	Fresno	1884	20.06	19.96	.45	.45	10.63	.53	1.65
681	Fresno	1887	23.24	22.67	.45	.53	12.36	.50	2.60
830	Fresno	1888	23.16	24.11	.34	.60	11.55	.58	2.10
114	San Gabriel	1884					11.42	.40	2.16
261	San Gabriel	1884	19.19	19.15	.54	.31	10.50	.60	2.05
348	Vina	1885	23.35		.39	.60	12.00	.68	2.69
471	Vina	1886	22.50		.50	.48	10.25	.75	1.80
362	Lower Lake	1885	22.69		.47	.40	11.00	.54	1.68
349	Harrisburg	1885	19.46		.80	.30	10.16	.65	1.93
366	Patchen	1885	12.62		.75	.32	6.00	.48	1.52
572	Sacramento	1886	24.00	24.33	.39	.39			
508	Livermore	1886	20.80	20.24	.44	.37	9.90	.40	2.05
692	Livermore	1887	22.87	22.67	.62	.42	11.18	.50	2.30
501	Cupertino	1886	13.10	11.68	1.02	.09	5.00	.79	1.30
748	Cupertino. (Long-pruned)	1887	19.40	19.21	.65	.33	9.90	.54	2.10
754	Cupertino. (Short-pruned)	1887	21.98	21.63	.81	.37	11.45	.66	2.30
940	Cupertino. (Short-pruned)	1888	19.13	19.75	.31	.39	9.54	.55	1.40
941	Cupertino. (Long-pruned)	1888	19.30	19.54	.63	.45			
1165	Cupertino	1889	20.10		.63				
1279	Cupertino	1890	19.30		.87				
2085	Cupertino	1893	17.20		.99				
1173	Mission San José	1889	21.20	21.55	.47	.32	10.42	.43	2.35
1383	Mission San José	1890	20.20		.68	.34	11.45	.50	2.44
1565	Mission San José	1891	20.60		.68		10.91	.62	2.32
1773	Mission San José	1892	20.70	19.21	.79		11.00	.55	2.20
2061	Mission San José	1893	22.60	21.63	.79	.23	11.64	.71	2.15
2241	Mission San José	1894	18.80		.69				
1449	Tulare	1891	21.50		.53				
1667	Tulare	1892	19.60		.56	.36	9.73	.51	2.35
1908	Tulare	1893	20.00	19.21	.75	.44	9.70	.45	2.60
2333	Tulare	1894	21.90	20.10	.55		10.17	.39	2.45
1539	Paso Robles	1891	23.70		.45				
1644	Paso Robles	1892	19.05		.80				
2008	Paso Robles	1893	22.05	21.40	.45	.39	11.00	.45	2.30
2217	Paso Robles	1894	22.80		.68				
1660	Amador station	1892	21.10		.60				
1839	Amador station	1893	15.20		.91				
1861	Amador station	1893	17.70		.90				
2190	Amador station	1894	24.35		.38				
2315	Amador station	1894	25.40		.41				
	Average, Fresno		**22.48**	**22.24**	**.41**	**.52**	**11.41**	**.32**	**2.32**
	Average, Livermore		**21.83**	**21.45**	**.52**	**.39**	**10.54**	**.45**	**2.17**
	Average, Cupertino		**19.48**	**20.03**	**.69**	**.38**	**10.29**	**.58**	**1.93**
	Average, Mission San Jose		**20.70**	**20.79**	**.68**	**.29**	**11.08**	**.56**	**2.29**
	Average, Tulare		**20.75**	**19.65**	**.59**	**.40**	**9.85**	**.45**	**2.46**
	Average, Paso Robles		**21.90**	**21.40**	**.57**	**.39**	**11.00**	**.45**	**2.30**
	Average, Amador station		**20.75**		**.65**				

AUSTRIAN AND HUNGARIAN TYPE—WHITE.

Throughout the vine-growing parts of Austria and Hungary, large quantities of light white wines are made, which are much appreciated for local consumption. The principal grapes used for this purpose are the Rother Steinschiller and the Slankamenka, for the mildest and lightest wines. These grapes average about 20% of sugar with 0.50% of acid. In California they show similar character, though the Slankamenka attains more sugar as a rule. Better, but still light and neutral wines are made from Wälschriesling, Velteliner, Rothgipfler, and Peverella. These are all promising for California, and are worthy of more extended trial. The finest wines of Austro-Hungary are made, generally, from the same grapes as those of Germany. The higher class of white grapes of France have also been introduced, and are cultivated with success. The Furmint or Gelber Mosler is extensively grown. In most places it makes a white wine of good medium quality; but in favored locations, such as that of Tokay, it makes wines of world-wide reputation.

The importance of testing the vines of this type will be realized when it is remembered that the production of wine in Austro-Hungary is second only to that in France, and for awhile exceeded it, after the advent of the phylloxera.

WÄLSCHRIESLING.

Description.—Vine small and not very vigorous; canes smooth, slender, with small and rather close joints; leaves five-lobed, of medium size, with well-marked and more or less deep sinuses, long, acute teeth, upper sinuses closed, the rest open, young leaves woolly, becoming glabrous; bunches small, conico-cylindrical, very slightly shouldered, sometimes double, rather close, on long, occasionally branched peduncles; berries small, round, juicy, with tender skin, varying in color from green to golden. The grapes ripen about the same time as the Johannisberg Riesling.

The Wälschriesling is said to have come originally from the Champagne district of France, and spread through southern Germany to Austria. What its name was (or is) in its original habitat has not been determined; its fruit resembles somewhat that of the Chardonay, but its leaves are very distinct. At present it is grown extensively in eastern Switzerland, Styria, and parts of lower Austria and Hungary. It succeeds best on warm, loose hillsides where the soil is fairly rich. In Austria it has the reputation of being the steadiest and heaviest bearer of any grapes capable of producing a good white wine. It has thus far not shown itself remarkable in this respect in California, but it is doubtful if it has yet been planted in the most suitable situations. It gives a wine of neutral character, resembling that of the true Riesling, except in its lack of special aroma. It is excellent for blending, and might advantageously be planted in association with the Johannisberg Riesling to offset the small bearing of the latter.

ANALYSES OF MUSTS AND WINES.

WÄLSCHRIESLING.	Date of Picking.	MUST.				WINE.			
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol. By Weight.	Alcohol. By Volume.	Total Acid as Tartaric, at Six to Eight Months.	Body.
1889—No. 1158. Cupertino	Oct. 9	23.50	23.13	.36	.29	10.81	13.27	.36	1.85
1890—No. 1240. Margherita Vineyard, Fresno	Aug. 23	26.90	27.13	.39	.40	11.15	13.64	.50	2.08
No. 1309. Mission San José	Oct. 5	21.70	.....	.57	.27	8.91	11.09	.34	1.90
1891—No. 1550. Paso Robles	Oct. 6	26.35	.....	.40	.....	.....	.....	.....	.....
1892—No. 1741. Paso Robles	Oct. 11	25.20	.....	.43	.....	.....	.....	.....	.....
1893—No. 1806. Amador station	Sept. 1	20.00	.....	.86	.....	.....	.....	.....	.....
No. 1886. Paso Robles	Sept. 19	26.00	.....	.45	.....	.....	.....	.....	.....
No. 1915. Paso Robles	Oct. 5	26.70	26.31	.41	.40	10.81	13.27	.30	2.30
No. 2028. Cupertino	Oct. 31	23.70	.....	.75	.....	.....	.....	.....	.....
1894—No. 2142. Amador station	Sept. 13	27.20	.....	.44	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1158. *Wälschriesling*, from J. T. Doyle, Cupertino. The grapes arrived October 10, 1889, in good condition, and were crushed the same day, the juice showing 23.50% of solid contents. The bunches were small, cylindrical, and close, with a distinct wing attached to nearly every one; grapes small and round, skin thin and tender, yellowish-green in color, with a brown spot at the end of each grape; flesh soft and juicy, sweet, and without special flavor; it corresponded exactly with Goethe's description, except that the bunches were very small. Fermentation commenced October 11th at 77°, and reached its maximum on October 13th at 81°. On October 17th the wine was dry. From 103.5 lbs. were obtained 7.31 gals., corresponding to 141.4 gals. per ton; pomace, 22.7%; stems, 5.8%.

In seven weeks after crushing the wine was bright, with a very light color, very strong bouquet, agreeable flavor, clean and developed taste; its acid, body, and alcohol were adequate, and quality good. A week later it was racked and taken to the cellar. At fourteen weeks it was still bright, but the bouquet had diminished somewhat; quality was good, but its taste still raw; lees sound. At six and one half months it was racked again. At eight months the wine was bright, with a marked bouquet, an agreeable flavor, but somewhat spoiled by slight taste of mold; quality good.

No. 1240. *Wälschriesling*, from Margherita Vineyard, Fresno. Received August 26, 1890, in good condition, and mature. The bunches were small, conico-cylindrical, very slightly shouldered, sometimes double, rather close; the berries were small, round, soft, and juicy, with tender skin, varying in color from green to golden. The must showed 26.9% of solid contents by spindle. The fermentation attained its maximum temperature of 81° on the third day, and after that continued slowly for over a month.

At the end of a month the wine was still cloudy and fermenting, and was racked for the second time. At the end of ten weeks it showed some good qualities, but had a suspicious taste. The lees showed a few lactic ferments. A month later the lactic taint was beginning to be noticeable to the taste, and the wine was pasteurized. At the end of nine months it was bright, but not clean-tasting. After this it changed very little, and was racked three times before it was bottled at seventeen months.

No. 1309. *Wälschriesling*, from J. T. Doyle, Cupertino. Received October 8, 1890, in bad condition, many of the grapes moldy. The must showed 21.7% of solid contents by spindle. The fermentation was cool, and lasted nine days; the maximum temperature reached was 73°, on the fourth day.

The wine was racked three times during the first four months, but was somewhat slow in clearing. At five months the lees showed some lactic ferments and the odor was slightly affected, so the wine was pasteurized. Two months later the wine was clear and free from lactic taste; it had a pleasing flavor and some bouquet. At fifteen months it was bright and much improved, with good flavor, some bouquet, and good body. At seventeen months it was mature, and was racked for the fifth time, and some of it bottled. The rest was bottled at twenty-three months. At three years both bottlings were in excellent condition, not highly flavored, but good wines; the last bottled was the brighter and cleaner-tasting.

No. 1550. *Wälschriesling*, from Paso Robles station. A sample for must analysis arrived October 8, 1891, in good condition, and mature; the bunches were small and compact. The must showed 26.35% of solid contents by spindle.

No. 1741. *Wälschriesling*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 25.2% of solid contents by spindle.

No. 1806. *Wälschriesling*, from Amador station. A sample for must analysis arrived September 1, 1893, in good condition. The bunches were small and compact, the berries small. The grapes were not quite mature. The must showed 20.0% of solid contents by spindle.

No. 1886. *Wälschriesling*, from Paso Robles station. This sample was received September 21, 1893, under the name of Blue Portuguese, but appeared to be identical with Wälschriesling. The grapes were in good condition, and the must showed 26.0% of solid contents by spindle.

No. 1915. *Wälschriesling*, from Paso Robles station. Received October 7, 1893, in good condition. The bunches were small, cylindrical, very compact, sometimes with a small wing; the berries small, round, thin-skinned, and juicy. The grapes were quite mature and commencing to shrivel. The must showed 26.7% of solid contents by spindle. The fermentation lasted nine days, and reached its maximum temperature of 78° on the second day.

At one month the wine was clear and clean-tasting, without any special flavor. At three months it had been racked three times, and was bright, heavy-bodied, without much character, and lacking in freshness. At seven months it showed little change, and was lacking in acid.

No. 2028. *Wälschriesling*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 31, 1893, in good condition. The bunches were of medium size, very irregular, branching, and well filled; the berries small, juicy, without special flavor, mature. The must showed 23.7% of solid contents by spindle.

GRÜNER VELTELINER.

Synonyms: Valtelliner; Valtellin; Veltliner; St. Valentin; Weissgipfler.

Description.—Vine vigorous, with medium-sized, rather short-jointed canes; leaves of medium size or larger, generally rather deeply five-lobed, but occasionally almost without sinuses, dark-green and glabrous above, loose-woolly below, teeth sharp and unequal; bunches of medium size or larger, conico-cylindrical, winged, close, but not compacted; berries small to medium, nearly round or slightly ovoid, juicy, thick-skinned, without special flavor, and late in ripening.

The Red Velteliner seems to have come originally from the province of Valtellina, in upper Italy, where it is still widely cultivated, being adapted to high altitudes. It is now widely spread over Austria and parts of Germany, and is considered a valuable grape.

The Grüner Velteliner, which differs materially from the other Velteliners, and in botanical characters approaches more nearly to the Rothgipfler, is not so widespread, but is common in lower Austria. The latter grape, which is the only one planted at the stations, has done well wherever tried. It is rather late in ripening, but has always developed a full amount of sugar, together with an adequate acidity. This is true even at Fresno, where the must has averaged 0.51% of acid with 26.3% of sugar. The average must composition, for six years, of grapes of this variety grown at Cupertino and at Mission San José has been 25.1% of sugar and 0.52% of acid. The wine is neutral in character, and requires the addition of some more aromatic grape for the production of a fine white wine. The vine bears well with short-pruning.

ANALYSES OF MUSTS AND WINES.

GRÜNER VELTELINER.	Date of Picking	MUST.				WINE.			
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Body
1889—No. 1108. J. T. Doyle, Cupertino	Sept. 26	25.60	25.76	.46	.40	10.35	12.82	.48	2.55
1890—No. 1208. Margherita Vineyard, Fresno	Aug. 12	23.30	22.23	.53	.40	9.20	11.45	.32	1.80
No. 1306. J. T. Doyle, Cupertino	Oct. 7	25.90	.....	.54	.33	.....	.....	.....	.....
No. 1346. J. Gallegos, Mission San José	Oct. 11	25.20	.....	.51	.30	11.23	13.73	.47	2.58
1891—No. 1454. Fresno	Aug. 28	26.60	.....	.48	....	10.35	12.82	.44	2.95
No. 1605. Mission San José	Oct. 25	23.50	24.12	.53	....	9.63	12.00	.40	2.15
1892—No. 1784. Mission San José	Oct. 20	24.25	.....	.55	....	.....	.....	.....	.....
1893—No. 1803. Amador station	Aug. 29	19.30	.....	.87	....	.....	.....	.....	.....
No. 1989. J. Gallegos, Mission San José	Oct. 19	24.80	23.61	.60	....	10.63	13.09	.57	2.30
No. 2101. J. T. Doyle, Cupertino	Nov. 6	28.00	.....	.51	....	.....	.....	.....	.....
1894—No. 2252. Mission San José	Oct. 5	23.50	.....	.49	....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1108. *Grüner Velteliner*, from J. T. Doyle, Cupertino. This variety arrived in poor condition September 27, 1889, and was crushed the same day; the juice showed 25.6 % of solid contents. The grapes resemble very much the Marsanne, both in bunches and leaves. Bunches branched and rather large, generally loose; grapes medium size and very slightly oval, varying in color from green to golden-yellow. Fermentation commenced September 28th, reached its maximum September 30th at 83.5°, and continued gently till October 5th, when the wine was dry. From 122 lbs. crushed, 8.62 gals. were obtained, corresponding to 141.6 gals. per ton.

At six weeks the wine was clear, with a light greenish-golden color, agreeable bouquet, clean, and fairly developed taste; acid and body adequate; general quality, very good. At two months it was racked and taken to the cellar. Seven weeks later the wine was clear, and its general effect very pleasant; bouquet not much developed, but agreeable; lees sound. In seven weeks it was racked again, and a month later the lees were found to be sound. At nine months from crushing the wine was bright, of a light, pleasing bouquet, and full, rich flavor, rather rough taste, full body and alcohol; quality good. At fifteen months the lees showed much *S. pastorianus* ferment. The wine was bright and with a delicate bouquet; as a whole, it was of very good quality and well matured at date. In a month it was bottled, and at seventeen months from crushing the wine was very good, but lacked in bouquet.

No. 1208. *Grüner Velteliner*, from Margherita Vineyard, Fresno. Received August 15, 1890, in good condition, and mature. The bunches were large to medium in size, very irregular in shape, generally conico-cylindrical, well shouldered or winged, often double, and varying from loose to well filled, but the berries never compressed; the berries were below average size, slightly oval, on long and slender pedicels; the flesh was crisp, juicy, and sweet, but without marked flavor. The must showed 23.3 % of solid contents by spindle. The fermentation was cool and prolonged. The maximum temperature of 78° was reached on the fourth day, and the must continued to ferment slowly for about ten days.

At five weeks the wine was nearly clear, and was racked for the second time. At three months it had a pleasant flavor and a little bouquet, soft acid; quality in general fair, but the after-taste not good. At six months the wine had been racked three times; it was clear and of good flavor, and possessed a little bouquet; the lees showed some lactic germs, but the taste was unaffected; it was pasteurized for safety. At nine months it was bright and pleasing, but a little flat. At sixteen months it was bright and mature, and had been racked four times. At eighteen months it was bottled. Two years after bottling the wine was tasted and found to be bright, clean-tasting, and well matured, with little bouquet or flavor, but sound and drinkable.

No. 1306. *Grüner Velteliner*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 8, 1890, in fair condition. The must showed 25.9 % of solid contents by spindle.

No. 1346. *Grüner Velteliner*, from Mission San José. Received October 14, 1890, in fair condition, with some rotten and moldy bunches. The must showed 25.2% of solid contents by spindle. The fermentation lasted eight days, and reached its maximum temperature of 77° on the third day.

At three weeks after crushing the wine was still cloudy and a little sweet. At seven weeks it was bright, very agreeably flavored, with medium acid and good body. At three months it had been racked twice, and was bright and sound, with a delicate bouquet, but a slightly smoky after-taste. It went on improving and maturing, and remained bright until the ninth month, when the lees showed a few lactic ferments, without the taste, however, being affected. At fourteen months it was clear, of good flavor, and with a little bouquet, but also with a faint suspicion of lactic taint in the after-taste. It was bottled two months later. At two years after bottling the wine was light, smooth, with good bouquet, but not quite clear or clean-tasting.

No. 1454. *Grüner Velteliner*, from Margherita Vineyard, Fresno. Received August 31, 1891, in good condition, and mature. The must showed 26.6% of solid contents by spindle. The fermentation reached its maximum temperature of 78° on the third day, and continued slowly for over two weeks.

At six weeks the wine was clear and dry, of good body and fairly agreeable, but with a somewhat doubtful after-taste. At four months the wine had been racked twice, and the lees showed a few long filaments; it was clear and of good bouquet and flavor, but the after-taste was not perfectly clean. It was racked twice more during the first year, and remained bright and matured well. At sixteen months it was bright, sound, and full-bodied. A month later it was bottled.

No. 1605. *Grüner Velteliner*, from Mission San José. Received October 28, 1891, in poor condition. The must showed 23.5% of solid contents by spindle. The fermentation lasted eight days, and reached its maximum temperature of 80° on the fourth day.

A month from crushing the wine was not quite clear, but full-flavored, smooth, and agreeable. At three months it was clear and very pleasing, but not quite clean-tasting. At six months it was clear and sound, but still raw. At eight months it had improved much, was bright, smooth, and aromatic, of good body and advanced development. At eleven months it was racked for the third time. At fifteen months it was in good condition and nearly mature. A month later it was bottled.

No. 1784. *Grüner Velteliner*, from Mission San José. Received October 21, 1892, in poor condition. The must showed 24.25% of solid contents by spindle. The grapes were fermented with No. 1783, Steinschiller.

No. 1803. *Grüner Velteliner*, from Amador station. A sample for must analysis arrived September 1, 1893, in good condition. The bunches were of medium size, the berries small. The must showed 19.3% of solid contents by spindle.

No. 1989. *Grüner Velteliner*, from Mission San José. Received October 19, 1893, in good condition. The bunches were from small to medium, conico-cylindrical, with a large or small wing, close, but not compacted, on slender peduncles; the berries were small, round, on very slender pedicels, soft, juicy, thin-skinned, without distinctive flavor. The grapes were quite mature. The must showed 24.8% of solid contents by spindle. The fermentation lasted six days, and reached its maximum temperature of 78° on the third day.

The wine continued fermenting gently for over a month, and was not quite clear or dry six weeks after crushing. At three months it was bright, of good bouquet and flavor, very fresh and clean-tasting, but without marked character. At seven months it had been racked three times, and tasted very smooth and agreeable.

No. 2101. *Grüner Velteliner*, from J. T. Doyle, Cupertino. A sample for must analysis arrived November 6, 1893, in good condition. The bunches were under medium size, conical, well filled, but not compact; the berries small, slightly elongated, juicy, thick-skinned, mature.

ROTHGIPFLER.

Synonym: Reifler.

Description.—Vine of medium size, hardy (and in Europe said to be very prolific); leaves of medium size, round, five-lobed, with somewhat shallow, open sinuses, teeth small; bunches of medium size, roundish, compact; berries small, round, juicy, with rather tough skin, and very much punctate. The grapes ripen rather late, and are of neutral flavor.

The Rothgipfler is a grape of lower Austria, where it is rather extensively planted, and whence it has spread into Bavaria and Würtemburg. It is prized in the vineyards of these countries, on account of its hardiness against extreme cold and heat, its fruitfulness, and the quality of its wines.

In California it has not maintained its reputation, especially in regard

to its bearing qualities. The vine has been planted in Cupertino, Mission San José, Amador, and Paso Robles, but only once has produced enough for a wine-making test. The wine made showed more character than that of the Grüner Velteliner, but the must is in general lower in acidity.

ANALYSES OF MUSTS AND WINES.

ROTHGIPFLER.	Date of Picking	MUST.				WINE.			
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Body
1889—No. 1105. J. T. Doyle, Cupertino	Sept. 26	28.20	28.07	.46	.34	11.46	14.00	.39	2.20
1890—No. 1359. J. T. Doyle, Cupertino	Oct. 11	28.00	.....	.46	....	.....	.....	.....	....
1891—No. 1530. Paso Robles	Oct. 6	26.50	.....	.34	....	.....	.....	.....	....
1892—No. 1722. Paso Robles	Oct. 10	25.20	.....	.41	....	.....	.....	.....	....
1893—No. 1800. Amador station	Sept. 1	21.10	.....	.87	....	.....	.....	.....	....
1894—No. 2143. Amador station	Sept. 13	28.90	.....	.35	....	.....	.....	.....	....
No. 2238. Mission San José	Oct. 5	22.60	.....	.49	....	.....	.....	.....	....

RECORD OF TREATMENT.

No. 1105. *Rothgipfler*, from J. T. Doyle, Cupertino. Grapes arrived September 27, 1889, and were crushed the same day. The juice showed 28.2% of solid contents by spindle. The condition of the grapes was rather good, but they had commenced to dry up a little. They corresponded to Pulliat's description, but the bunches were somewhat more elongated. Fermentation commenced September 28th at 72.5°, and reached its maximum September 29th at 82°. On the seventh day the wine was dry and had fallen to the cellar temperature (72°). From 46.5 lbs. crushed were obtained 3.87 gals., corresponding to 167 gals. per ton; pomace, 30.6%; stems, 3.8%.

At six weeks from crushing the wine was clear, the color light-green, bouquet pleasant, but a little woody; flavor fruity, but tasting slightly of the wood; general quality good and advanced. At two months it was racked and taken to the cellar. At fifteen weeks the wine was in good order and of agreeable flavor and bouquet, but still had the woody taste; lees sound. Two months later it was racked into a one-gallon keg, and after six weeks the lees were found to be sound. At nine months from crushing the condition of the wine was bright, the bouquet and flavor both full and, but for a taste of cask, very agreeable; well developed, with good alcohol and body; general quality good.

No. 1359. *Rothgipfler*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 13, 1890, in good condition. The bunches were small, cylindrical, close, on short and slender peduncles; the berries small, regular, somewhat oval, on short and slender pedicels; the skin thick, tough, yellowish-green, much spotted; the flesh firm and sweet. The must showed 28.0% of solid contents by spindle.

No. 1530. *Rothgipfler*, from Paso Robles station. A sample for must analysis arrived October 8, 1891, in good condition. The bunches were small and compact, with round-ovoid berries. The grapes were mature, and the must showed 26.5% of solid contents by spindle.

No. 1722. *Rothgipfler*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 25.2% of solid contents by spindle.

No. 1800. *Rothgipfler*, from Amador station. A sample for must analysis arrived September 4, 1893, in good condition, but not quite mature. The bunches were of medium size, compact, with small berries. The must showed 21.1% of solid contents by spindle.

PEVERELLA.

Synonym: Pfeffertraube.

Description.—Vine very vigorous; leaves of medium size, not very deeply lobed, smooth above, loose-woolly below; bunches large, conico-cylindrical, compact, on thick peduncles; berries of medium size, nearly

round, juicy, tough-skinned, of greenish color. The vines do well in moist soils, but only in warm localities. The grapes ripen late, but in suitable localities attain a high percentage of sugar with good acid.

The Peverella is cultivated principally in southern Tyrol and Venetia. It is said to give there a good, alcoholic wine of fair aroma. At the Experiment Stations it has shown itself a vigorous grower and good bearer. The must has always had good to high acid, but occasionally fails to develop enough sugar in the cooler localities. The wine made has been neutral in character, smooth and agreeable, but evidently needs blending with a variety of higher quality.

ANALYSES OF MUSTS AND WINES.

PEVERELLA.	Date of Picking.	MUST. Solid Contents by Spindle.	MUST. Sugar by Copper Test.	MUST. Acid as Tartaric.	MUST. Ash.	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Total Acid as Tartaric, at Six to Eight Months.	WINE. Body.
1889—No. 1190. J. T. Doyle, Cupertino	Oct. 17	20.40	.....	.50	.22	7.78	9.73	.36	1.55
1890—No. 1406. J. T. Doyle, Cupertino	Oct. 20	23.05	.....	.87	.27	9.70	12.09	.57	2.32
No. 1426. J. Gallegos, Mission San José	Oct. 28	29.10	.....	.92	....	.....	.....	.....	....
1891—No. 1463. Fresno	Aug. 28	23.92	22.67	.74	.43	9.41	11.73	.48	2.25
No. 1602. Cupertino	Oct. 23	20.85	20.24	.67	.30	8.70	10.83	.52	2.05
1892—No. 1743. Paso Robles	Oct. 11	24.35	.....	.41	....	.....	.....	.....	....
No. 1782. Mission San José	Oct. 18	23.15	.....	.80	....	.....	.....	.....	....
1893—No. 1836. Amador station	Sept. 5	22.60	.....	.89	....	.....	.....	.....	....
No. 1941. Tulare	Oct. 10	24.40	.....	.50	....	.....	.....	.....	....
No. 2015. Mission San José	Oct. 25	23.10	21.22	.94	.23	9.70	12.09	.67	2.80
1894—No. 2191. Amador station	Sept. 25	26.90	.....	.51	....	.....	.....	.....	....
No. 2300. Mission San José	Oct. 12	19.75	.....	.67	....	.....	.....	.....	....
No. 2330. Tulare	Oct. 15	26.90	.....	.38	....	.....	.....	.....	....

RECORD OF TREATMENT.

No. 1190. *Peverella*, from J. T. Doyle, Cupertino. Grapes arrived October 18, 1889, in good condition, and were crushed the same day. The bunches were medium in size, cylindrical, winged, rather loose; grapes were small, round, or sometimes very slightly longer than their width; skin not thick, but rather tough; color from green to golden, with a light bloom; flesh soft and juicy; flavor acid; stems thick; pedicels long and slender; maturity complete. The juice showed 20.40% of solid contents by spindle. Fermentation of 113½ lbs. crushed began on October 19th at a temperature of 68° (room, 72°), and reached its maximum the following day at a temperature of 76°, and remained at the same temperature during twenty-four hours, when the murk was drawn off. The yield from the above amount was $9\frac{3}{16}$ gals., corresponding to 161.89 gals. per ton; pomace, 19.6%, and stems, 5.06%.

At one month the wine was nearly clear, and was racked. At three months it was still nearly clear; bouquet and flavor not marked; taste rather flat; acid adequate; quality raw, but may mature-out well. At six months the lees were sound; a not quite bright wine, but tastes sound; racked again. At eight months the wine was bright, very light amber in color, with a peculiar, smoky bouquet and flavor; taste clean; body and acid rather low. Quality thin, but not bad.

No. 1406. *Peverella*, from J. T. Doyle, Cupertino. Received October 23, 1890, in good condition; fine, large, well-filled bunches of under-average sized, round grapes, mature. The must showed 23.05% of solid contents by spindle. The fermentation lasted eight days, and reached its maximum temperature of 84° on the third day.

At one month the wine showed good quality, was nearly clear, and had a good flavor, some aroma, medium acid, and good body. At two months it was racked for the second time, and a month later the lees showed a few lactic rods, so the wine was pasteurized. The taste had not become affected by the lactic ferment. At seven months the wine

was bright and much improved, of full, delicate bouquet and flavor. It was racked twice after this, but the quality deteriorated. Some of it was bottled at eighteen and some at twenty-six months, but it did not keep well in bottle.

No. 1426. *Peverella*, from Mission San José. A sample for must analysis arrived October 31, 1890, in poor condition, overripe. The must showed 29.1% of solid contents by spindle.

No. 1463. *Peverella*, from Margherita Vineyard, Fresno. Received August 31, 1891, in good condition, but not quite mature. The must showed 23.92% of solid contents by spindle. The fermentation was slow and cool. The maximum temperature of 75° was reached on the second day, and the murk remained at this temperature for two days, after which it continued fermenting slowly at about the temperature of the room (71° to 74°) for a month.

At the end of six weeks the wine was nearly clear and quite dry. At ten weeks it was bright, and showed good flavor and aroma. At the end of five months it had been racked twice, and was bright and clean-tasting. It remained sound and became smoother, but developed little bouquet. It was racked four times during the first year. At sixteen months it was in good condition, very smooth and agreeable, and quite mature. A few days after this it was bottled.

No. 1602. *Peverella*, from J. T. Doyle, Cupertino. Received October 24, 1891, in good condition. The must showed 20.85% of solid contents by spindle. The fermentation was slow and cool, lasting ten days. Five weeks from crushing the wine was racked for the second time, and blended with No. 1601, White Vernaccia.

No. 1743. *Peverella*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 24.35% of solid contents by spindle.

No. 1782. *Peverella*, from Mission San José. A sample for must analysis was received October 21, 1892, in poor condition. The must showed 23.15% of solid contents by spindle.

No. 1836. *Peverella*, from Amador station. A sample for must analysis arrived September 8, 1893, in good condition. The bunches were of good size, long-cylindrical, fairly compact; the berries small, not mature. The must showed 22.6% of solid contents by spindle.

No. 1941. *Peverella*, from Tulare station. A sample for must analysis was received October 13, 1893, in good condition, but a little sunburned. The bunches were small, compact, irregularly conico-cylindrical; the berries over medium in size, with thick, tough skin, and without flavor. The must showed 24.4% of solid contents by spindle.

No. 2015. *Peverella*, from Mission San José. Received October 25, 1893, in good condition. The bunches were over medium in size, close, conico-cylindrical, slightly shouldered or with one small wing; the berries of medium size, nearly round, juicy, thick-skinned, not quite mature. The must showed 23.1% of solid contents by spindle. It was fermented with No. 2014, White Vernaccia.

VERNACCIA BIANCA.

Synonyms: Vernazza; Weiss-Vernatsch.

Description.—Vine vigorous; leaves of medium size, dark green, smooth above, a little woolly below, deeply lobed, and with acute teeth; bunches of medium size, conico-cylindrical, somewhat compact, generally without shoulders; berries small, firm, juicy, and nearly round, greenish-white; seeds free from the pulp, sharp, and incurved.

The name Vernaccia is given to several distinct grapes in Italy, but the one described above is that which forms the bulk of the white-wine vineyards of northern and southern Tyrol. It is also grown in Lombardy and the province of Pavia. It bears well with moderately short-pruning, and is especially adapted to low and damp situations, on account of its tardiness in coming out in the spring. It ripens its grapes a little earlier than the Peverella, and attains rather a higher percentage of sugar. It is noted for retaining a good amount of acid, even with high sugar-contents, but at the Tulare station it has failed to confirm its reputation in this respect.

In suitable locations it gives a full-bodied, alcoholic wine, of good quality, but with less aroma than the best Rhine-wine varieties. It will doubtless prove an excellent variety in warm localities, for damp valley

lands subject to early frosts, in association with the Peverella, with which it makes a very good blend.

ANALYSES OF MUSTS AND WINES.

VERNACCIA BIANCA.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Body
1889—No. 1091. J. Gallegos, Mission San José	Sept. 17	24.36	24.64	.66	.37				
No. 1148. J. T. Doyle, Cupertino	Oct. 8	23.15	21.80	.55	.31	9.70	12.09	.40	2.45
1890—No. 1236. Margherita Vineyard, Fresno	Aug. 22	23.40	23.13	.53	.33				
No. 1400. J. T. Doyle, Cupertino	Oct. 18	25.90		.68					
No. 1422. J. Gallegos, Mission San José	Oct. 28	28.60		.66					
1891—No. 1549. Paso Robles	Oct. 6	22.60	21.80	.32					
No. 1601. Cupertino	Oct. 26	23.70	23.61	.81	.33				
1892—No. 1723. Paso Robles	Oct. 10	25.45		.36					
No. 1781. Mission San José	Oct. 18	24.80		.65		9.92	12.36	.73	2.70
1893—No. 2014. Mission San José	Oct. 24	24.80	23.80	.84	.32				
No. 2104. Cupertino	Nov. 4	24.80		1.07					
1894—No. 2188. Amador station	Sept. 23	24.70		.38					
No. 2305. Mission San José	Oct. 10	22.20		.51					
No. 2328. Tulare	Oct. 13	23.30		.32					

RECORD OF TREATMENT.

No. 1091. *Vernaccia bianca.* From J. Gallegos, Mission San José. The grapes arrived September 19, 1889, consisting of only a few bunches for must analysis. Their maturity was irregular. They corresponded to Pulliat's description, except that none of the bunches had wings. The juice showed 24.36 % of solid contents by spindle.

No. 1148. *Vernaccia bianca,* from J. T. Doyle, Cupertino. The grapes arrived October 9, 1889, and were crushed the same day. The bunches were irregular, some cylindrical, some conical and branched, not compact. The grapes were slightly oval, medium size; skin green, thick, rather tough; flesh very soft and juicy; flavor quite spoilt by overripeness and rain. The grapes had commenced to rot. The juice showed 23.15 % of solid contents by spindle. Fermentation of 118¼ lbs. crushed started on the afternoon of October 10th at 69° (room, 72°), and reached its maximum of 77.5° on October 12th (room, 72°), gradually falling to 70° on October 17th, when the wine was dry, and was put in keg.

The yield from the above amount was 77⅝ gals. of wine, corresponding to 131.2 gals. per ton; pomace, 28.5 %, and stems, 3.8 %.

Twenty-one days after crushing the wine was clear, the bouquet developing, the flavor agreeable and smooth, the taste clean, the acid normal, and the alcoholic strength high; the general quality was good and well developed for its age. In five days it was racked and taken to the cellar. At eighty days the wine was still clear, with a delicate and pleasing bouquet and flavor, much developed since last tasting; lees sound. At six months it was racked again. Eight months after crushing, it was bright, bouquet perfumed, taste rather thin, but is otherwise of very good quality; acid and alcoholic strength adequate.

No. 1236. *Vernaccia bianca,* from Fresno. A sample for must analysis arrived August 25, 1890, in fair condition, and quite mature. The must showed 23.4 % of solid contents by spindle and 0.53 % of acid.

No. 1400. *Vernaccia bianca,* from Cupertino. A sample for must analysis was received October 21, 1890, in fair condition, and somewhat overripe. The must showed 25.9 % of solid contents by spindle and 0.68 % of acid.

No. 1422. *Vernaccia bianca,* from Mission San José. A sample for must analysis was received October 31, 1890. The must showed 28.6 % of solid contents by spindle and 0.66 % of acid.

No. 1549. *Vernaccia bianca*, from Paso Robles station. A sample for must analysis was received October 8, 1891, in good condition, and mature. The bunches were small, but well filled. The must showed 22.6% of solid contents by spindle and 0.32% of acid.

No. 1601. *Vernaccia bianca*, from Cupertino. Received October 24, 1891, in good condition. The must showed 23.7% of solid contents by spindle and 0.81% of acid. Only 30 lbs. of grapes were crushed, and the fermentation lasted eleven days, the highest temperature reached being 74°.

The wine was racked eleven days after crushing, and at one month was clear, with good but neutral flavor, and good acid. At six weeks it was racked again and blended with No. 1602, Peverella, in the proportion of one third Vernaccia to two thirds Peverella. At three months the wine was very clear, clean-tasting, with full acid and neutral flavor, and was racked again. The lees were examined microscopically at three and at four months, and found to be quite sound. At five months it was racked again, and was bright and fresh-tasting. At seven and eight months it showed little change, and was racked again. At fifteen months the wine was bright, smooth, and mature, with good flavor and a little bouquet; it was then bottled. After two years in bottle the wine had acquired a slight Sherry character; it was very smooth and agreeable, but without marked flavor or bouquet.

No. 1723. *Vernaccia bianca*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 25.45% of solid contents by spindle and 0.36% of acid.

No. 1781. *Vernaccia bianca*, from Mission San José. Received October 21, 1892, in fair condition. The must showed 24.8% of solid contents by spindle and 0.65% of acid. The grapes were fermented with No. 1782, Peverella, in the proportion of one fifth Vernaccia to four fifths Peverella. The highest temperature reached during fermentation was 77°.

In one month the wine was quite clear, and was racked. At three months it was bright, of full, rich flavor, some bouquet, high acid, and generally of good quality. Two months later it was in good condition, and was racked again. Tastings at eight, ten, and fourteen months showed steady maturing and gradual development of bouquet. At fifteen months the wine was still very good, but had become a little *éventé*. As the wine would evidently not improve further in so small a keg (five gallons), it was bottled. Two years after bottling the wine was very good; it was full-flavored, full-bodied, and with good acid. The bouquet was rather faint, but of good quality. Altogether, it was a very successful blend.

No. 2014. *Vernaccia bianca*, from Mission San José. Received October 26, 1893, in good condition. The bunches were small, conico-cylindrical, somewhat compact, not shouldered; berries small, round, juicy, with full acid. The seeds are quite characteristic, being quite free from the pulp, sharp, and incurved. The must showed 24.8% of solid contents by spindle and 0.84% of acid. The grapes were fermented with No. 2015, Peverella, in the proportion of nine sixteenths Vernaccia to seven sixteenths Peverella. The fermentation lasted nine days, reaching the maximum temperature of 76° on the third day. A parallel fermentation was made of the same quantity of each variety of grapes, with the addition of some German yeast. As no precautions were taken to exclude the ordinary yeast, the result was perfectly negative. There was apparently no difference in the course of fermentation or in the resulting wine of the two experiments, except that the must to which the yeast was added became dry a few days before the other, a result that is easily understood without predicating any peculiar properties of the German yeast.

No. 2014 (ordinary ferment). Two weeks after the first racking the wine was clear, but still a little sweet; it was racked again and taken to the cellar. At three months it was bright, clean-tasting, and with good flavor and aroma. At four months the wine had been racked three times, and was in very good order; a very agreeable wine, but without marked character. At eight months the wine was bright, clean-tasting, highly acid, but rather too neutral in flavor. The wine had no lees. At nineteen months it was mature, and was put in bottle. Six months after bottling the wine was perfectly bright, and had deposited no sediment. It was a smooth, good wine, much improved, and had developed a little bouquet. It tasted more mature than No. 2014*a*; in fact, a little flat.

No. 2014*a* (German ferment). Two weeks after the first racking the wine was clear and dry. At one month it was taken to the cellar. At three months it was bright, clean-tasting, with some aroma, and rather fresher-tasting than No. 2014. Several tastings after this showed little difference between the two samples, except that the wine which had been fermented with the ordinary ferments seemed to develop a little quicker. At fifteen months it was well developed, had good flavor, and had more bouquet than No. 2014. At nineteen months it tasted mature, and was bottled. Six months after bottling it was perfectly bright, and had developed no sediment. It was of distinctly higher bouquet than No. 2014, fresher-tasting, and generally better. The difference of character, which at first was scarcely noticeable, was at this time marked. The use of the German ferment seemed to have caused a slower maturity, but the development of higher quality.

FURMINT.

Synonyms: Gelber Mosler; Formint; Tokayer.

Description.—Vine vigorous, with thick, upright canes; leaves large thick, three-lobed, hairy below, teeth large and blunt, petiole thick, reddish, and somewhat hairy, young leaves white-woolly; bunches large, loose, long conico-cylindrical; berries of medium size, oval, on long, slender pedicels; flesh crisp, not juicy; skin from green to brown-yellow, and marked with brown dots and blotches.

This is the most valued and one of the most widely grown vines of Hungary and Austria. It is not found elsewhere, except to a limited extent in the south of France, where it was introduced from Hungary; and the name of Mosler is said not to be derived from the Moselle River, for it is not known in that district. It is valued on account of the high amount of sugar which it attains, and is used, especially in Styria, for mixing with thin, neutral grapes, such as the Heunish, to increase their alcoholic contents and quality. It is famous chiefly, outside of Austria, for making the celebrated sweet wines of Tokay. The vine is said to be a good bearer in its native country, but at the Experiment Stations it has produced very little. It has borne well and produced some good wine at Fresno. It ripens rather early, and requires medium-long pruning, and a warm location.

Record of Treatment.

No. 2189. *Furmint*, from Amador station. A sample for must analysis was received September 24, 1894, in good condition. The bunches were large, loose, and badly coulured; the berries from large to small, ellipsoidal, on long, slender pedicels, which were not swollen at the junction with the berries; flesh crisp, not juicy; skin thin, from green to brown-yellow, conspicuously marked with brown spots and blotches; flavor not marked, but sweet. The must showed 23.15% of solid contents by spindle and 0.38% of acid.

ZIERFAHNDLER.

Description.—Vine strong and vigorous, with thick, dark-brown canes; leaves round, of medium size, five-lobed, with shallow sinuses, lobes overlapping, glabrous above, little downy below, teeth short and blunt; bunches small, cylindrical, with small shoulders, compact; berries small, round, soft, juicy, thin-skinned, sweet, but without special flavor.

The above description of this grape as grown in California does not agree altogether with that given of the Rother Zierfahndler of Austria by Goethe. Our grape has smaller bunches, more deeply colored berries, and ripens earlier. This variety is considered by some authors to be simply a pink-fruited form of the Franken Riesling, with which it has great similarity in leaf characters. It is a strong grower, and bears fairly well; its wine has rather more character than that of the Franken Riesling, but is far from possessing the strong aroma of the Traminer. In the warmer parts of California it fails to color well or to develop its aroma. It is rather later than the Ruländer, but if left long enough on the vines it attains almost an equal amount of sugar, with rather higher acid. It bears, in the districts suited to it (that is, the cooler coast counties), with short-pruning. The Zierfahndler is said in Austria to attain the highest percentage of sugar of any grape and to make an extremely fiery, alcoholic wine, which retains part of the sugar unfermented, and is very much appreciated as a dessert wine.

ANALYSES OF MUSTS AND WINES.

ZIERFAHNDLER.	Date of Picking.	MUST. Solid Contents by Spindle.	MUST. Sugar by Copper Test.	MUST. Acid as Tartaric.	MUST. Ash.	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Total Acid as Tartaric, at Six to Eight Months.	WINE. Body.
1889—No. 1133. J. T. Doyle, Cupertino	Oct. 2	23.30	23.13	.47	.33	9.05	11.27	.44	2.35
1890—No. 1314. J. Gallegos, Mission San José	Oct. 7	26.50	.....	.41	.40	10.81	13.27	.50	....
No. 1323. J. T. Doyle, Cupertino	Oct. 11	24.35	.....	.75	....	.....	.....	.....	....
1891—No. 1577. Mission San José	Oct. 13	27.35	.....	.33	....	11.32	13.75	.32	2.70
1892—No. 1760. Paso Robles	Oct. 11	18.15	.....	.46	....	.....	.....	.....	....
1893—No. 2090. J. T. Doyle, Cupertino	Nov. 5	24.80	.....	.60	....	.....	.....	.....	....
1894—No. 2279. Amador station	Oct. 4	22.60	.....	.42	....	.....	.....	.....	....
No. 2280. Mission San José	Oct. 4	20.00	.....	.53	....	.....	.....	.....	....

RECORD OF TREATMENT.

No. 1133. *Zierfahndler*, from J. T. Doyle, Cupertino. Received October 3, 1889, in good condition, and crushed the same day. The grapes were ripe, the bunches over average in size, some loose from coulure, but in general compact. The berries on loose bunches were rather large, quite round, and rose-colored; those on compact bunches were smaller and green, except where exposed to the sun; the skin was soft, but rather thick; the flesh sweet and juicy; the stems thick and the pedicels long. The temperature of the grapes at crushing was 71°, and the maximum reached was 77°, on the second day.

At two months the wine was nearly bright and had a slight schiller color, was of fair quality, but tasted of the wood; it was racked and taken to the cellar. Two months later it was bright and had lost some of its pinkish tinge, had developed some bouquet, and was generally much improved. An examination of the lees showed no unsound germs. At six months the wine was racked for the third time, and at seven months the lees were examined and found to contain some unsound germs. The wine was of good quality, well-flavored and full-bodied, but was somewhat affected by the secondary ferments. It was pasteurized, but did not improve; it remained flat and developed no bouquet.

No. 1314. *Zierfahndler*, from Mission San José. Received October 10, 1890, in somewhat bruised condition, but not moldy. The must showed 26.5% of solid contents by spindle. The fermentation was cool, and lasted six days.

At one month the wine had been racked twice, was clear, smooth, full-bodied, and with marked aroma. At three months the lees showed much lactic ferment, and the taste was affected; it was pasteurized, but remained cloudy for some time. At fourteen months it was clear and much improved, but still showed some lactic taste. At seventeen months it was racked. At twenty-seven months the bottled wine was bright, very smooth and soft, sound, but a little flat.

No. 1323. *Zierfahndler*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 13, 1890, in fair condition. The must showed 24.35% of solid contents by spindle.

No. 1577. *Zierfahndler*, from Mission San José. Received October 16, 1891, in fair condition, and mature. The must showed 27.35% of solid contents by spindle. The must attained its maximum temperature of 80° on the third day, and fermented for five days, when it was nearly dry.

The wine was a little slow in clearing, and at one month the lees showed a little lactic ferment. At six weeks the wine was pasteurized. At five months the wine was good, but a little flat, full-bodied, low in acid, and with a remarkably high aroma. At seven months it had improved, and tasted quite sound. At ten months it was racked for the fourth time. At fifteen months it still retained its high flavor and full aroma, and had become smoother and cleaner-tasting. As it was in a small keg, it was bottled.

No. 1760. *Zierfahndler*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 18.15% of solid contents by spindle.

No. 2090. *Zierfahndler*, from J. T. Doyle, Cupertino. A sample for must analysis was received November 6, 1893, in good condition; the bunches were under medium size, long-conical, and compact; the berries small, soft, juicy, very sweet, and mature. The must showed 24.8% of solid contents by spindle.

ROTHER STEINSCHILLER.

Synonyms: Rosentraube; Rother Verschetzer.

Description.—Vine very vigorous, with thick, short-jointed canes; leaves large, flat, little lobed, sharply toothed, the under side white-woolly; bunches of medium size, short, irregular, much branched, compact; berries under medium size, round, firm, from green to pink, according to position on the bunch, and becoming brownish with advanced maturity, skin very astringent, flavor neutral. The grapes ripen rather late and resist the action of the weather very well.

The Rother Steinschiller is cultivated extensively in parts of the Banat in southern Hungary, but is little known elsewhere. In cooler climates it will only ripen in the warmest exposure. In the Banat it bears large crops every year, with short-pruning. The Steinschiller vineyards produce large quantities of a mild, cheap wine, which is considered indispensable by the Austrian and Hungarian wine-merchants for blending purposes.

The Steinschiller has given results in California very similar to those reported from its native home. It bears well at all the stations where tried, and produces a neutral wine, low in alcohol, with medium acid, agreeable to drink, but without special flavor, and requiring the addition of some grape of more marked character. It is an extremely healthy vine, and is one of the best resisters of the *oidium* mildew.

ANALYSES OF MUSTS AND WINES.

STEINSCHILLER.	Date of Picking.	MUST.				WINE.			
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol.		Total Acid as Tartaric, at Six to Eight Months.	Body.
						By Weight.	By Volume.		
1889—No. 1174. J. Gallegos, Mission San José	Oct. 15	20.50	20.61	.33	.21	8.27	10.36	.57	2.32
No. 1201. J. T. Doyle, Cupertino	Oct. 23	19.30	18.89	.24	.23	7.85	9.82	.33	1.66
1890—No. 1415. J. T. Doyle, Cupertino	Oct. 27	20.60	.....	.50	.29	8.91	11.09	.45	2.14
No. 1424. J. Gallegos, Mission San José	Oct. 28	23.70	.....	.53	....	.....	.....	.....	.....
1892—No. 1783. Mission San José	Oct. 18	17.35	.....	.73	....	.....	8.46	.48	2.10
1893—No. 1996. Mission San José	Sept. 30	21.70	.....	.73	....	.....	.....	.....	.....
No. 2016. Mission San José	Oct. 26	21.50	20.46	.55	.30	8.91	11.18	.68	2.60
No. 2068. Paso Robles	Nov. 1	21.50	20.99	.43	.27	14.02*	17.92*	.41	3.90
No. 2103. Cupertino	Nov. 2	21.20	.....	.50	....	.....	.....	.....	.....

* Fortified.

RECORD OF TREATMENT.

No. 1174. *Steinschiller*, from Mission San José. Received October 16, 1889, in good condition, and mature. The bunches were of average size, conico-cylindrical, sometimes shouldered or winged, close; berries under medium size, round, light red, with thick bloom, thick but tender skin, firm and juicy flesh, flavor agreeable and sweet, but not marked; peduncles thick and woody, pedicels of medium length, and slender.

Only enough grapes were received to make one gallon of wine. It was of golden color, medium acid, very agreeable flavor, and in general a very promising wine, but owing to the smallness of the sample, it soon became acetified. The wine was kept for five months, then pasteurized; it developed some bouquet, and at seventeen months showed good quality, but was injured because of the smallness of the sample.

No. 1201. *Steinschiller*, from Cupertino. Received October 24, 1889, in good condition. Bunches of medium to over medium size, conical, heavily shouldered, generally compact; berries small, round, dark-rose colored, with thick but tender skin, rather soft and juicy flesh, agreeably flavored, but rough; maturity complete. The grapes had been exposed on the vines to many days of heavy rains, but were uninjured. The must showed 19.3% of solid contents by spindle and 0.24% of acid. The 70.5 lbs. of grapes received were made up into 5.5 gals. of white wine.

The wine was bright six weeks after pressing, of very light color, with little bouquet, and peculiar but not very agreeable flavor, low-bodied, and rather flat. It was racked and taken to the cellar, and six weeks later it was bright, improved in bouquet and flavor, but still rather insipid and watery-tasting. The wine was completely neutral in character, not disagreeable, but without any distinctive qualities. At six months the lees showed some bitter ferments, so the wine was pasteurized. One month later the wine was bright and tasted nearly mature, but was still insipid. After this it remained sound, and improved a little. At seventeen months it was bottled. It remained bright and sound in bottle, and at two years and a half it had improved and was of fair quality. Tasted a year later it had changed very little.

No. 1415. *Steinschiller*, from Cupertino. Received October 30, 1890, in good condition, and mature. The must showed 20.6% of solid contents by spindle and 0.50% of acid. The grapes were crushed on the day of arrival, 227.5 lbs. in all making 17.63 gals. of wine. The temperature of the must at crushing was 66.5°, and the maximum reached was 77°, on the third day.

The wine was dry on the eleventh day, when it was racked off the lees. At one month the wine was still cloudy, but the lees were sound. At two months the wine was bright, had light bouquet, full and pleasing but not marked flavor, sufficient acid, body, and alcohol; in general, of good quality. At four and at six months examination of the lees showed them to be sound. At six months the wine was bright, clean-tasting, and well developed. At fourteen months it showed good bouquet, full, rich flavor, was quite mature, sound, and clean-tasting. Two months later it was racked and part put in bottle. Six months later the remainder was bottled. At three years the bottled wine was in good order and of good quality, but without marked or special character. That first bottled had the best aroma, but tasted a little raw.

No. 1424. *Steinschiller*, from Mission San José. A sample for must analysis was received October 31, 1890, in good condition; well colored and mature. The must showed 23.7% of solid contents by spindle and 0.53% of acid.

No. 1783. *Steinschiller*, from Mission San José. A sample for must analysis was received October 21, 1892, in poor condition. The must showed 17.35% of solid contents by spindle and 0.73% of acid. The grapes were fermented with No. 1784, Grüner Velteliner, in the proportion of 124 lbs. of the former to 144.5 lbs. of the latter. The temperature of the must at pressing was 66°, and the maximum reached was 78°, on the third day.

In one month the wine was quite clear, and was racked and taken to the cellar. At three months the wine was bright, smooth, and pleasing, without much flavor or bouquet, but sound and good. Two months later it had developed a good bouquet, and was racked for the second time. After this it remained in good order, and at fourteen months was very good and nearly mature. At seventeen months it was bottled.

No. 1936. *Steinschiller*, from Mission San José. A sample for must analysis was received October 1, 1893, in good condition, but not quite mature. The bunches were large, conical, heavily shouldered and winged, close; the berries under medium in size, round, and firm. The must showed 21.7% of solid contents by spindle and 0.73% of acid.

No. 2016. *Steinschiller*, from Mission San José. Received October 26, 1893, in good condition, but not quite mature. The bunches were over medium in size, branching, irregular, well filled, and with very heavy peduncles; berries from small to medium, round, dull red, with very astringent skin and small seeds. The 139.5 lbs. of grapes were made up into 12 gals. of white wine. The temperature of the must at pressing was 69°, and the maximum reached was 75°, on the third day.

In one month the wine was clear, and was racked and taken to the cellar. At three months it was bright, with a little bouquet, not much flavor, full acid—a clean, neutral wine. Two weeks later it was racked for the second time, and at six months it was a very robust, clean-tasting wine, without much character, but pleasing. After this it remained in good order, a good neutral wine, but did not improve much. At fifteen months the lees showed *S. pastorianus*, and the wine was bright, but lacking in character.

No. 2068. *Steinschiller*, from Paso Robles station. Received November 3, 1893, in good condition, but not quite mature. The bunches were small to medium, well filled, irregularly conical, sometimes branching; berries round, under medium in size, green or pink, fresh-tasting, with astringent skin and without much flavor. The must showed 21.5% of solid contents by spindle and 0.43% of acid. The grapes were crushed on the day received, and 108 lbs. yielded 8.13 gals. of wine. The temperature of the must at pressing was 64°, and the maximum reached was 76°, on the fourth day. The must fermented very slowly, and on the ninth day, when still sweet, it was fortified for sweet wine.

A month after fortifying it was not quite bright and tasted a little too sweet. A week

later it was racked and put in the hot chamber, at a temperature of 95°, where it was kept for three months. At eight months it was racked again. At twenty months it was perfectly bright, of a beautiful golden color, without much aroma, but with clean taste and good promise.

No. 2103. *Steinschiller*, from Cupertino. A sample for must analysis was received November 3, 1893, in good condition. The bunches were of medium size or under, conical, shouldered or with one or two wings nearly as large as the main bunch, compact; berries medium size, round, of a purplish-brown color, juicy, and with a very astringent skin. The must showed 21.20% of solid contents by spindle and 0.43% of acid.

SLANKAMENKA.

Synonym: Mayarka.

Description.—Vine very vigorous and fruitful, with thick, short-jointed canes; leaves shining, yellowish-green, five-lobed, and a little woolly below; bunches large, conical, and well filled; berries of medium size, oval, yellowish-white, becoming slightly tinged with red where exposed to the sun, pulpy, thick-skinned, and not easily injured by the weather.

This variety is, next to the Steinschiller, the most widely cultivated in southern Hungary for the production of ordinary, light white wines. It bears heavily with short-pruning, and is very free from injury by the ordinary diseases of the vine. It has borne fair crops at the Experiment Stations, but has not exhibited the great productiveness which is claimed for it in Hungary. It has, on the contrary, attained a higher percentage of sugar here than in Europe, and gives a very agreeable wine.

ANALYSES OF MUSTS AND WINES.

SLANKAMENKA.	Date of Picking.	MUST. Solid Contents by Spindle.	MUST. Sugar Test by Copper.	MUST. Acid as Tartaric.	MUST. Ash.	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Total Acid as Tartaric, at Six to Eight Months.	WINE. Body.
1889—No. 1197. J. T. Doyle, Cupertino	Oct. 23	18.80	17.71	.39	.41	6.42	8.07	.46	1.63
1890—No. 1410. J. T. Doyle, Cupertino	Oct. 27	18.20	.....	.62	.....	.....	.....	.....	.....
1893—No. 1988. J. Gallegos, Mission San José	Oct. 18	25.95	25.19	.54	.30	10.16	12.64	.50	2.60
No. 2092. J. T. Doyle, Cupertino	Nov. 5	23.30	.....	.59	.....	.....	.....	.....	.....
1894—No. 2228. Mission San José	Oct. 5	22.00	.....	.55	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1197. *Slankamenka*, from J. T. Doyle, Cupertino. Received October 24, 1889, in poor condition. In spite of their European reputation for good keeping qualities, the grapes were injured by the rain. The must showed 18.8° of solid contents by spindle and 0.39% of acid. The bunches were of average size, conical, shouldered, and compact; the berries of medium size, slightly oval, thick but not tough skin, with firm but juicy flesh, of yellowish color, much spotted, and of neutral flavor. The peduncles and pedicels were short. The temperature of the grapes at crushing was 68°, and the maximum reached was 75°, on the third day.

At seven weeks the wine was clear, very light-colored, smooth, and with nutty flavor, but without aroma; it was of rather low acid and good quality. At this time it was racked for the second time and taken to the cellar. At ten weeks the lees showed *Mycoderma vini*, and a month later the wine showed the effect of secondary ferments, and was not clear, so it was pasteurized. A month later it was clear, but much deteriorated in flavor by the presence of volatile acids. After this it rapidly deteriorated.

No. 1410. *Slankamenka*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 30, 1890, in good condition; nearly ripe, but not sweet. The must showed 18.2% of solid contents by spindle and 0.62% of acid.

No. 1988. *Slankamenka*, from Mission San José. Received October 19, 1893, in good condition. The bunches were of medium size, irregularly conico-cylindrical, with or without small wings, well filled but not compact, on very thick, herbaceous peduncles; berries small, ovoid, crisp, juicy, on slender pedicels. The grapes were mature and very fresh-tasting, but without special flavor. The must showed 25.95% of solid contents by spindle and 0.54% of acid. The temperature of the grapes at crushing was 63°, and the maximum reached was 78°, on the third day. The wine was nearly dry on the eighth day, when it was drawn off.

At one month the wine was not clear and was still fermenting a little. Two weeks later, when it was racked for the second time and taken to the cellar, it was still a little sweet. At four months it was racked for the third time; it was bright, of good flavor and aroma, very clean-tasting and fresh, but without marked character. At eight months it tasted very smooth and agreeable. At ten months it was nearly mature, was in good order, smooth, with agreeable acidity, and had developed some bouquet. A week later it was bottled.

No. 2092. *Slankamenka*, from J. T. Doyle, Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were over medium in size, conical, heavily shouldered, well filled; the berries of medium size, slightly oval, crisp, thick-skinned, and astringent. The grapes were mature, and the must showed 23.3% of solid contents by spindle and 0.59% of acid.

BAKATOR.

Synonym: Bacador.

Description.—Vine vigorous; canes strong, somewhat erect, with large joints, the younger parts woolly; leaves large, deeply lobed, often with closed sinuses, short-toothed, glabrous above, more or less woolly below, petioles woolly; bunches large, spreading, irregular; berries of medium size, round, crisp, juicy, of neutral flavor and bright rose color. The down on the leaves varies much with locality. At Cupertino and Mission San José the leaves are white woolly below; at Tulare they are green below and much less woolly. The down on the young canes and leaf stalks seems constant. At Tulare the grapes do not color well.

The Bakator is cultivated principally at Arad, in Hungary, and in Transylvania. It requires a warm climate, and grows well even in very poor soils. It bears well with half-long pruning, but when short-pruned coulures very badly. The grapes are very agreeable to eat, and ornamental for the table when well colored. They are, however, too delicate for shipping, and, as they are neither very early nor very late, the planting of more than a few vines for home use cannot be recommended. In Hungary, the wine of the Bakator is said to be smooth, of low acidity, and very alcoholic. In California, so far, it has made a neutral, clean-tasting wine, but not of quality sufficient to encourage its propagation, especially in view of its extreme liability to coulure.

ANALYSES OF MUSTS AND WINES.

BAKATOR.	Date of Picking.	MUST.				WINE.				
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol. By Weight.	Alcohol. By Volume.	Total Acid as Tartaric, at Six Months.		Body.
1890—No. 1319. Cupertino	Oct. 11	24.05	.....	.71	.....	.....	.....	.....	.....	.....
1891—No. 1537. Paso Robles	Oct. 6	22.60	.....	.48	.....	.....	.....	.....	.....	.....
1892—No. 1728. Paso Robles	Oct. 10	24.80	.....	.47	.....	.....	.....	.....	.....	.....
1893—No. 1841. Amador station	Sept. 5	18.80	.....	.66	.....	.....	.....	.....	.....	.....
No. 2011. Mission San José	Oct. 26	20.60	19.90	.80	.25	.....	.....	.....	.....	.....
No. 2080. Paso Robles	Nov. 2	24.80	23.61	.44	.32	10.01	12.54	.40		2.10
No. 2089. Cupertino	Nov. 5	21.50	.....	.83	.....	.....	.....	.....	.....	.....
1894—No. 2179. Amador station	Sept. 24	24.80	.....	.49	.....	.....	.....	.....	.....	.....
No. 2202. Tulare	Sept. 27	25.00	.....	.41	.....	.....	.....	.....	.....	.....
No. 2232. Mission San José	Oct. 5	20.30	.....	.62	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1319. *Bakator*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 13, 1890, in good condition. The must showed 24.05 % of solid contents by spindle.

No. 1537. *Bakator*, from Paso Robles station. A sample for must analysis arrived October 8, 1891, in good condition. The bunches were of medium size, rather loose; the berries of medium size and well colored. The grapes were mature, and the must showed 22.6 % of solid contents by spindle.

No. 1728. *Bakator*, from Paso Robles station. A sample for must analysis arrived October 13, 1892, in good condition. The must showed 24.8% of solid contents by spindle.

No. 1841. *Bakator*, from Amador station. A sample for must analysis arrived September 8, 1893, in good condition, but not mature. The bunches were of medium size, the berries small and very unevenly colored. The must showed 18.8% of solid contents by spindle.

No. 2011. *Bakator*, from Mission San José. A sample for must analysis arrived October 26, 1893, in good condition. The bunches were large, irregularly branching, short, very loose, and much coulured; the berries under medium in size, crisp, with high, fresh-tasting acid; the peduncles of the bunches were very large. The must showed 20.6 % of solid contents by spindle.

No. 2080. *Bakator*, from Paso Robles station. Received November 4, 1893, in fair condition; a little moldy. The bunches were large, spreading, and loose; the berries of medium size, fairly well colored, and very sweet. The must showed 24.8 % of solid contents by spindle. The fermentation was slow and prolonged, and reached its maximum temperature of 78° on the third day.

The wine was clear in three weeks from crushing. It was racked three times during the first three months. At six months it was clear and clean-tasting, with a little bouquet, but without much body or character.

No. 2089. *Bakator*, from J. T. Doyle, Cupertino. A sample for must analysis arrived November 6, 1893, in good condition. The bunches were over medium size, irregularly branching, much coulured; the berries of medium size, well colored, crisp, with full acid, but mature. The must showed 21.5 % of solid contents by spindle.

GREEN HUNGARIAN.

Synonym: Long Green.

Description.—Vine a strong grower, with long, grayish-brown canes; leaves slightly lobed, acutely serrate, glabrous above and hairy below; bunches large, conical, with small shoulders, close; berries over medium in size, round, thin-skinned, juicy, covered with bloom.

This is one of the many grapes which have appeared in California without any record of their origin. It is very likely the "Weisse Heunisch," with which Goethe's description agrees very well. It is a

heavy bearer in localities to which it is suited. At Tulare, with the system of pruning to which it has been subjected, it has produced very little, but has shown itself a very vigorous grower. It is a somewhat tasteless grape, but makes a good, light, neutral wine.

ANALYSES OF MUSTS AND WINES.

GREEN HUNGARIAN.	No. 1403. Cupertino.	No. 2004. Tulare.	No. 2094. Cupertino.
Date of picking	Oct. 21, 1890	Oct. 21, 1893	Nov. 4, 1893
Must.			
Solid contents by spindle	20.40	21.50	20.00
Acid as tartaric	.65	.48	.64
Ash	.31	.45	
Wine.			
Alcohol by weight	9.20		
Alcohol by volume	11.45		
Acid at five months	.57		
Body	1.75		

RECORD OF TREATMENT.

No. 1403. *Green Hungarian*, from Cupertino. Received October 23, 1890, in good condition. The bunches were of medium size, conical, shouldered, well filled, but not compressed, on thin stems; berries round, spotted, with thin but tough skin, and light bloom; flesh soft, juicy, and with neutral flavor. The must showed 20.4% of solid contents by spindle and 0.65% of acid. The temperature of the grapes at crushing was 67°, and the maximum reached was 81°, on the third day. On the fifth day the wine was dry.

On the eighth day the wine was racked off the thick lees. At one month the wine was clear, and was racked for the second time. It was of neutral flavor and without aroma, clean-tasting, with full acid and low body. At three months the wine was racked again, and the lees were examined at two, three, five, and seven months, and found to be sound. At seven months the wine was bright, maturing well, not of high quality, but a good neutral wine. At fourteen months it was bright, pleasing, and nearly mature. Three months later it was racked again and part put in bottle. At twenty-three months it was all bottled. At three years and three months both samples were bright and sound; that bottled first was fresher-tasting and showed more flavor and aroma; they were, however, both good, clean-tasting wines, without marked character.

No. 2004. *Green Hungarian*, from Tulare station. A sample for must analysis was received October 23, 1893, in good condition. The bunches were of good size, conical, with small shoulders, close but not compacted; berries over medium in size, round, thin-skinned, juicy, sweet, and commencing to shrivel. The must showed 21.5% of solid contents by spindle and 0.48% of acid.

No. 2094. *Green Hungarian*, from Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were large and with branches almost equaling the main bunch, close; the berries were small, round, soft, juicy, and without flavor. The must showed 20.0% of solid contents by spindle and 0.64% of acid.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF AUSTRIAN AND HUNGARIAN TYPE.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Total Acid as Tartaric, at Six to Eight Months	WINE. Body
	Walschriesling.								
1158	Cupertino	1889	23.50	23.13	.36	.29	13.27	.36	1.85
2028	Cupertino	1893	23.70	.....	.75	.....	.....	.....	.....
1240	Fresno	1890	26.90	27.13	.39	.40	13.64	.50	2.08
1309	Mission San José	1890	21.70	.....	.57	.27	11.09	.34	1.90
1550	Paso Robles	1891	26.35	.....	.40	.....	.....	.....	.....
1741	Paso Robles	1892	25.20	.....	.43	.....	.....	.....	.....
1886	Paso Robles	1893	26.00	.....	.45	.....	.....	.....	.....
1915	Paso Robles	1893	26.70	26.31	.41	.40	13.27	.30	2.30
1806	Amador station	1893	20.00	.....	.86	.....	.....	.....	.....
2142	Amador station	1894	27.20	.....	.44	.....	.....	.....	.....
	Average, Cupertino	.....	**23.60**	**23.13**	**.55**	**.29**	**13.27**	**.36**	**1.85**
	Average, Paso Robles	.....	**25.81**	**26.31**	**.42**	**.40**	**13.27**	**.30**	**2.30**
	Average, Amador station	.....	**23.60**	.....	**.65**	.....	.....	.....	.....
	Grüner Velteliner.								
1108	Cupertino	1889	25.60	25.76	.46	.40	12.82	.48	2.55
1306	Cupertino	1890	25.90	.....	.54	.33	.....	.....	.....
2101	Cupertino	1893	28.00	.....	.51	.....	.....	.....	.....
1208	Fresno	1890	23.30	22.23	.53	.40	11.45	.32	1.80
1454	Fresno	1891	26.60	.....	.48	.....	12.82	.44	2.95
1605	Mission San José	1891	23.50	24.12	.53	.....	12.00	.40	2.15
1346	Mission San José	1890	25.20	.....	.51	.30	13.73	.47	2.58
1784	Mission San José	1892	24.25	.....	.55	.....	.....	.....	.....
1989	Mission San José	1893	24.80	23.61	.60	.....	13.09	.57	2.30
2252	Mission San José	1894	23.50	.....	.49	.....	.....	.....	.....
1803	Amador station	1893	19.30	.....	.87	.....	.....	.....	.....
	Average, Cupertino	.....	**26.50**	**25.76**	**.50**	**.36**	**12.82**	**.48**	**2.55**
	Average, Fresno	.....	**24.95**	**22.23**	**.50**	**.40**	**12.13**	**.38**	**2.37**
	Average, Mission San Jose	.....	**24.25**	**23.86**	**.53**	**.30**	**12.94**	**.48**	**2.34**
	Rothgipfler.								
1105	Cupertino	1889	28.20	28.07	.46	.34	14.00	.39	2.20
1359	Cupertino	1890	28.00	.....	.46	.....	.....	.....	.....
1530	Paso Robles	1891	26.50	.....	.34	.....	.....	.....	.....
1722	Paso Robles	1892	25.20	.....	.41	.....	.....	.....	.....
1800	Amador station	1893	21.10	.....	.87	.....	.....	.....	.....
2143	Amador station	1894	28.90	.....	.35	.....	.....	.....	.....
2238	Mission San José	1894	22.60	.....	.49	.....	.....	.....	.....
	Average, Cupertino	.....	**28.10**	**28.07**	**.46**	**.34**	**14.00**	**.39**	**2.20**
	Average, Paso Robles	.....	**25.85**	.....	**.37**	.....	.....	.....	.....
	Average, Amador station	.....	**25.00**	.....	**.61**	.....	.....	.....	.....
	Peverella.								
1190	Cupertino	1889	20.40	.....	.50	.22	9.73	.36	1.55
1406	Cupertino	1890	23.05	.....	.87	.27	12.09	.57	2.32
1602	Cupertino	1891	20.85	20.24	.67	.30	10.83	.52	2.05
1426	Mission San José	1890	29.10	.....	.92	.....	.....	.....	.....
1782	Mission San José	1892	23.15	.....	.80	.....	.....	.....	.....
2015	Mission San José	1893	23.10	21.22	.94	.23	12.09	.67	2.80
2300	Mission San José	1894	19.75	.....	.67	.....	.....	.....	.....
1463	Fresno	1891	23.92	22.67	.74	.43	11.73	.48	2.25
1743	Paso Robles	1892	24.35	.....	.41	.....	.....	.....	.....
1836	Amador station	1893	22.60	.....	.89	.....	.....	.....	.....
2191	Amador station	1894	26.90	.....	.51	.....	.....	.....	.....
1941	Tulare	1893	24.40	.....	.50	.....	.....	.....	.....
2330	Tulare	1894	26.90	.....	.38	.....	.....	.....	.....
	Average, Cupertino	.....	**21.43**	**20.24**	**.68**	**.33**	**10.88**	**.48**	**1.97**
	Average, Mission San Jose	.....	**23.77**	**21.22**	**.83**	**.23**	**12.09**	**.67**	**2.80**
	Average, Amador station	.....	**24.75**	.....	**.70**	.....	.....	.....	.....
	Average, Tulare	.....	**25.43**	.....	**.44**	.....	.....	.....	.....

SUMMARY OF ANALYSES OF MUSTS AND WINES OF AUSTRIAN AND HUNGARIAN TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST.				WINE.			
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Total Acid as Tartaric, at Six to Eights Month	Body
	Vernaccia.								
1091	Mission San José	1889	24.36	24.64	.66	.37			
1422	Mission San José	1890	28.60		.66				
1781	Mission San José	1892	24.80		.65				
2014	Mission San José	1893	24.80	23.80	.84	.32			
2305	Mission San José	1894	22.20		.51				
1148	Cupertino	1889	23.15	21.80	.55	.31	12.09	.40	2.45
1400	Cupertino	1890	25.90		.68				
1601	Cupertino	1891	23.70	23.61	.81	.33			
2104	Cupertino	1893	24.80		1.07				
1236	Fresno	1890	23.40	23.13	.53	.53			
1549	Paso Robles	1891	22.60	21.80	.32				
1723	Paso Robles	1892	25.45		.36				
2188	Amador station	1894	24.70		.38				
2328	Tulare	1894	23.30		.32				
	Average, Mission San Jose		**25.35**	**24.22**	**.66**	**.34**			
	Average, Cupertino		**24.36**	**22.70**	**.68**	**.32**	**12.09**	**.40**	**2.45**
	Average, Paso Robles		**24.02**	**21.80**	**.34**				
	Furmint (Mosler).								
2189	Amador station	1894	23.15		.38				
	Zierfahndler.								
1133	Cupertino	1889	23.30	23.13	.47	.33	11.27	.44	2.35
1323	Cupertino	1890	24.35		.75				
2090	Cupertino	1893	24.80		.60				
1314	Mission San José	1890	26.50		.41	.40	13.27	.50	
1577	Mission San José	1891	27.35		.33		13.75	.32	2.70
2280	Mission San José	1894	20.00		.53				
1760	Paso Robles	1892	18.15		.46				
2279	Amador station	1894	22.60		.42				
	Average, Cupertino		**24.15**	**23.13**	**.60**	**.33**	**11.27**	**.44**	**2.35**
	Average, Mission San Jose		**24.62**		**.42**	**.40**	**13.51**	**.41**	**2.70**
	Rother Steinschiller.								
1174	Mission San José	1889	20.50	20.61	.33	.21	10.36	.57	2.32
1424	Mission San José	1890	23.70		.53				
1783	Mission San José	1892	17.35		.73		8.46	.48	2.10
1996	Mission San José	1893	21.70		.73				
2016	Mission San José	1893	21.50	20.46	.55	.30	11.18	.68	2.60
1201	Cupertino	1889	19.30	18.89	.24	.23	9.82	.33	1.66
1415	Cupertino	1890	20.60		.50	.29	11.09	.45	2.14
2103	Cupertino	1893	21.20		.50				
2068	Paso Robles	1893	21.50	20.99	.43	.27			
	Average, Mission San Jose		**20.95**	**20.53**	**.57**	**.25**	**10.27**	**.63**	**2.46**
	Average, Cupertino		**20.36**	**18.89**	**.41**	**.26**	**10.45**	**.39**	**1.90**
	Slankamenka.								
1197	Cupertino	1889	18.80	17.71	.39	.41	8.07	.46	1.63
1410	Cupertino	1890	18.20		.62				
2092	Cupertino	1893	23.30		.59				
1988	Mission San José	1893	25.95	25.19	.54	.30	12.64	.50	2.60
2228	Mission San José	1894	22.00		.55				
	Average, Cupertino		**20.10**	**17.71**	**.52**	**.41**	**8.07**	**.46**	**1.63**
	Average, Mission San Jose		**23.65**	**25.19**	**.54**	**.30**	**12.64**	**.50**	**2.60**
	Bakator.								
1319	Cupertino	1890	24.05		.71				
2089	Cupertino	1893	21.50		.83				
1537	Paso Robles	1891	22.60		.48				
1728	Paso Robles	1892	24.80		.47				

SUMMARY OF ANALYSES OF MUSTS AND WINES OF AUSTRIAN AND HUNGARIAN TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Total Acid as Tartaric, at Six to Eight Months	WINE. Body
	Bakator—Continued.								
2080	Paso Robles	1893	24.80	23.61	.44	.32	12.54	.40	2.10
1841	Amador station	1893	18.80	.....	.66	.....	.....	.....	.....
2179	Amador station	1894	24.80	.....	.49	.....	.....	.....	.....
2011	Mission San José	1893	20.60	19.90	.80	.25	.....	.....	.....
2232	Mission San José	1894	20.30	.....	.62	.....	.....	.....	.....
2202	Tulare	1894	25.00	.....	.41	.....	.....	.....	.....
	Average, Cupertino	.....	**22.77**	.....	**.77**	.....	.....	.....	.....
	Average, Paso Robles	.....	**36.06**	**23.61**	**.46**	**.32**	**12.54**	**.40**	**2.10**
	Average, Amador station	.....	**21.80**	.....	**.57**	.....	.....	.....	.....
	Average, Mission San Jose	.....	**22.30**	**19.90**	**.61**	**.25**	.....	.....	.....
	Green Hungarian.								
1403	Cupertino	1890	20.40	.....	.65	.31	11.45	.57	1.75
2094	Cupertino	1893	20.00	.....	.64	.....	.....	.....	.....
2004	Tulare	1893	21.50	.....	.48	.45	.....	.....	.....
	Average, Cupertino	.....	**20.20**	.....	**.64**	**.31**	**11.45**	**.57**	**1.75**

PORT TYPE.

(See Vit. Rept. 1887–89, p. 255.)

Though the Portuguese are notoriously careless wine-makers, it is only lately and to a limited extent that we have been able to make Ports which approach their best wines in quality. This is due to a variety of causes. The proper Port grapes have been planted to a very limited extent only. The localities where most of the Ports have been made lack that advantage of soil and situation possessed by the banks of the Douro. Even when Port is made in a good locality it is but too often only an attempt to give a new lease of life to a moribund dry wine, or it is made from grapes which do not possess the composition and characteristics necessary to the production of a good Port. The Ports of the Douro also owe much of their excellence to skillful handling, and especially blending, after fermentation. The wines are partially fortified at the vineyard prior to, during, or immediately after fermentation, and shipped to the large storage cellars. The fermentation is thus sometimes prolonged for months. As the fermentation and fortifying are carried on, as a rule, in a somewhat haphazard way, the wines arrive at the storage cellars with very varying degrees of alcohol and sugar. They are, however, immediately blended and refortified, in order to make a uniform product. The wines are subjected to thorough aëration, both during fermentation and in subsequent handling. This is a point generally neglected in California. It is also worthy of note that all the best Ports are made from a mixture of grapes. This has been the

experience with the wines made at the Experiment Stations. No grape, so far tested, makes a thoroughly satisfactory Port alone. Tinta de Madeira is the nearest to being an exception, but even this variety is improved by an addition of Tinta Câo or Mourisco Preto.

Red liqueur wines are not made so commonly as the white, but in most wine-making countries a little is produced. The red Muscats of Italy and the sweetish "auslese" wines of Germany may be included in this group.

TINTA DE MADEIRA.

(See Vit. Rept. 1883–85, p. 140; 1887–89, p. 270.)

Synonym: Negramol.

Description.—Vine fairly vigorous; canes very light-colored; leaves of medium size, obtusely serrate, slightly or not at all lobed, petiolar sinus quite closed, young shoots tomentose, older leaves glabrous above with more or less loose tomentum below; bunches of medium size, conico-cylindrical, generally close, shouldered, on herbaceous peduncles; berries of medium size, juicy, tender-skinned, on slender pedicels.

The Negramol, so called from the soft feel of the berries and the dark color of the skin, according to its reputation in the island of Madeira, should make a deep-colored, very astringent wine. In California it makes a wine with a fair amount of color, which, however, soon deposits and turns yellowish. The astringency varies very much with the locality. In the northern coast counties it is sufficiently high for a dry wine, but in warmer localities the tannin contents are low. The vine bears well with long or half-long pruning, and the grapes attain very regularly a high percentage of sugar. The acid is full for a Port grape, but it is admirably suited to the purpose. It has a smoothness and roundness of flavor which makes it much more desirable for this purpose, used alone, than any of the other Port grapes tried. It is improved, however, by blending with Tinta Amarella or Mourisco preto, and can be recommended for planting as a Port grape with some good bearing variety of less character and lower acidity.

The bunches are almost always perfectly sound, and coulure is very rare.

ANALYSES OF MUSTS AND WINES.

TINTA DE MADEIRA.	Date of Picking	MUST.				WINE.						
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At Six Months	Body	Sugar
1890—No. 1247. Fresno	Aug. 24	24.80	24.22	.50	.43	15.25	18.78	.126	.45	.38	4.02	1.40
No. 1301. Mission San José	Oct. 5	23.70	.....	.52	.30	9.41	11.73	.241	.53	.38	2.82	.....
No. 1363. Cupertino	Oct. 14	27.45	.....	.54	.35	16.23	19.96	.164	.56	.53	4.32	.96
1891—No. 1459. Fresno	Aug. 28	24.80	.....	.57	.....	15.25	18.78	.225	.53	.47	3.25	.23
No. 1487. Paso Robles	Sept. 9	21.50	.....	.48	.....	.....	.....	.....	.....	.....	.....	.....
No. 1567. Mission San José	Oct. 6	24.53	.....	.48	.....	17.08	20.99	.270	.65	.43	2.95	.....
1892—No. 1630. Tulare	Sept. 3	23.70	.....	.42	.....	16.31	20.06	.126	.50	.44	3.35	1.75
No. 1651. Paso Robles	Sept. 13	25.86	.....	.59	.....	.....	.....	.....	.....	.....	.....	.....
No. 1771. Mission San José	Oct. 13	23.05	22.67	.56	.....	14.73	18.14	.136	.63	.50	2.86	1.34
1893—No. 1850. Amador station	Sept. 13	23.90	21.38	.56	.33	13.41	17.26	.096	.56	.68	3.00	2.50
No. 1896. Paso Robles	Sept. 26	26.70	26.31	.39	.37	16.53	21.19	.115	.38	.41	3.22	1.08
No. 1977. Tulare	Oct. 14	24.40	.....	.42	.40	.....	.....	.....	.38	.....	.....	.....
No. 2056. Cupertino	Nov. 1	24.80	.....	.56	.....	.....	.....	.320	.....	.....	.....	.....
No. 2072. Mission San José	Nov. 3	26.30	25.76	.44	.27	.....	.....	.....	.....	.....	.....	.....
1894—No. 2146. Amador station	Sept. 13	26.50	.....	.48	.....	.....	.....	.....	.....	.....	.....	.....
No. 2255. Mission San José	Oct. 5	22.60	.....	.44	.....	.....	.....	.237	.....	.....	.....	.....
No. 2337. Tulare	Oct. 19	25.90	.....	.39	.....	.....	.....	.....	.....	.....	.....	.....

COLOR READINGS.

TINTA DE MADEIRA.	At Pressing.		One Month.		Two Months.		Three Months.		Four Months.		Five Months.		Six Months.	
1890—No. 1247. Fresno	38.8	4VR	12.3	2VR+2Y	11.4	4VR+2Y	7.1	1R+2Y						
No. 1301. Mission San José	43.4	2VR	24.3	4VR	16.5	5VR	12.1	1R	10.8	3VR+1Y	9.8	5VR+1Y	11.0	4VR+1Y
No. 1363. Cupertino	34.8	5VR	18.5	5VR+1Y	19.2	1R+1Y	12.5	3R+2Y						
1891—No. 1459. Fresno	13.3	R	12.2	1R	23.0	1VR+1Y	19.5	2VR+1Y	16.4	5VR+1Y	11.3	3R+1Y		
No. 1567. Mission San José	111.1	1VR	25.0	R to 1R	28.6	1VR+1Y	25.5	3VR+1Y	22.1	4VR+1Y				
1892—No. 1630. Tulare	22.8	2VR	12.9	1VR+1Y	12.9	1VR+1Y	14.0	1VR+1Y	14.0	4VR+1Y	12.9	5VR+1Y		
No. 1771. Mission San José	121.0	2VR	41.6	4VR	22.5	1R	21.6	1R	21.6	1R				
1893—No. 1850. Amador station	39.2	3VR	22.3	1R	18.5	2R	16.3	2R						
No. 1896. Paso Robles	22.5	5VR	11.6	3R	13.3	4R								
No. 1977. Tulare	26.8	4VR												
No. 2056. Cupertino	40.0	4VR												
No. 2072. Mission San José	62.5	2VR												

RECORD OF TREATMENT.

No. 1247. *Tinta de Madeira*, from Fresno. Received August 27, 1890, in fair condition, and quite mature. The must showed 24.8% of solid contents by spindle and 0.50% of acid. The grapes were crushed at a temperature of 67°, and placed in a room which was kept at a temperature of between 91° and 98°. The wine fermented strongly, and reached a maximum temperature of 95° on the second day. On the third day the pomace was pressed and the wine fortified with 70% spirits.

At five months the wine was quite bright, but tasted raw. It was racked and put in a heating-chamber at a temperature of 110°, where it remained for three months. One month after removal from the heating-chamber the wine was clear, very well constituted, but somewhat coarse and rough. At eighteen months the wine was racked for the fourth time. It was a very fair Port, with rich bouquet and some flavor, much toned down and improved. After this it did not improve, being in too small a quantity to keep well.

No. 1301. *Tinta de Madeira*, from Mission San José. Received October 7, 1890, in poor condition, many of the grapes being moldy. The grapes were crushed and fermented as dry wine. The temperature at crushing was 71°, and the maximum reached was 90°, on the third day. On the sixth day the wine was dry and was pressed.

One month after crushing the wine was nearly clear. At two months the wine was fermenting a little and had a slightly bitter taste, but the lees appeared sound on microscopic examination. It was nearly clear, of full and pleasing flavor, low acid, full astringency, good body, and a slightly moldy odor. After this it deteriorated and showed poor keeping qualities.

No. 1363. *Tinta de Madeira*, from Cupertino. Received October 17, 1890, in good condition, and mature. The must showed 27.45% of solid contents by spindle and 0.54% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 94°, on the third day. On the fourth day the wine was drawn off and fortified.

Three months after pressing the wine was not quite clear, tasteless, and of low quality. It was racked and put in a heating-box, at a temperature of 110°, where it was left for three months. One month after taking from the heating-chamber it was improved in flavor, but still not clear or clean-tasting. It was then racked for the third time. At sixteen months it was clear and had developed a little bouquet, but was without flavor, a little bitter, and poor generally. A year later it had improved somewhat, but was at best only a second-rate Port. At four years it had improved a little more and was put in glass. Fourteen months after putting in glass the wine was much improved, and was an agreeable Port with some bouquet, little flavor; a smooth, neutral wine, without positive defect, but lacking in character, and very light in color.

No. 1459. *Tinta de Madeira*, from Fresno. Received August 31, 1891, in good condition. The must showed 24.8% of solid contents by spindle and 0.57% of acid. Only a small quantity of grapes was crushed, and the temperature of the must varied from 66° at crushing to 84° on the fifth day. On the fifth day the wine was drawn off the pomace, and on the sixth day fortified with 70% spirits.

Four months after pressing the wine was bright, of good flavor and color, and clean-tasting, but a little too dry. Two months later it was racked and put in the heating-chamber, at a temperature of from 90° to 95°, where it was left for three months. At three years it had marked Port character, but was too dry and a little bitter. At four years it was a Port of very marked character, with strong bouquet and flavor. It was of too pronounced character for use alone, and required toning-down by blending.

No. 1487. *Tinta de Madeira*, from Paso Robles station. A sample for must analysis was received September 11, 1891, in good condition. The must showed 21.5% of solid contents by spindle and 0.48% of acid.

No. 1567. *Tinta de Madeira*, from Mission San José. Received October 9, 1891, in fair condition, and mature. The must showed 24.53% of solid contents by spindle and 0.48% of acid. The temperature of the grapes at crushing was 60°, and the maximum reached was 84°, on the fourth day. The wine was drawn off on the fourth day, and fortified on the sixth.

Three months after pressing the wine was clear, of good color and full flavor, but rather too dry. A month later it was racked and put in the heating-chamber, at a temperature of from 90° to 95°, where it remained three months. At thirteen months it was in good condition, and had improved. It was rather lacking in flavor, but the bouquet was good and the sweetness had increased to the right degree by evaporation. At four years it was an agreeable Port, with less character and more color than wine from the same grape from Fresno, and had a slight but not unpleasant bitterness.

No. 1630. *Tinta de Madeira*, from Tulare station. Received September 6, 1892. There is some doubt as to the identity of this lot. The grapes came mixed with Tinta Amarella, and appeared to be Tinta de Madeira, though in the absence of leaves its identity was uncertain. The grapes were in good condition, and mature. The temperature at crushing was 69°, and the maximum reached was 85°, on the third day. On the fourth day the wine was drawn off and fortified.

At three months the wine was bright and of good quality, but rather too dry. At six months it was racked, sweetened and refortified, and put in the heating-chamber, at a

temperature of from 90° to 95°, where it was left for three months. At one year it was in good condition, a full-flavored, clean-tasting, and very agreeable Port. At three years the wine retained its good qualities, and had improved. It was less marked in character than the wine from the same grape from Fresno, but was better wine to use unblended.

No. 1651. *Tinta de Madeira*, from Paso Robles station. A sample for must analysis was received September 16, 1892, in good condition. The must showed 25.86% of solid contents by spindle and 0.59% of acid.

No. 1771. *Tinta de Madeira*, from Mission San José. Received October 15, 1892. The must showed 23.05% of solid contents by spindle and 0.56% of acid. The temperature of the must at crushing was 58°, and the maximum reached was 85°, on the fourth day. The wine was dry on the fifth day, when it was drawn off and fortified.

At one month the wine was clear, and at two months it was bright and promising. At five months it was racked for the third time, sweetened, fortified, and put in the heating-chamber, where it was kept at a temperature of from 90° to 95° for three months. At nine months it was bright and of good quality. At two years it was somewhat lacking in flavor and too acid. At four years it was much improved in bouquet and flavor, very clean-tasting, but a little thin, and required blending with a heavier wine.

No. 1850. *Tinta de Madeira*, from Amador station. Received September 15, 1893, in good condition. The bunches and grapes were very small, and showed damage from *oidium*. The must showed 23.9% of solid contents by spindle and 0.56% of acid. The grapes were fermented in a temperature of from 80° to 85°. On the fifth day the wine was drawn off and fortified. The wine did not turn out well, and was without color or character.

No. 1896. *Tinta de Madeira*, from Paso Robles station. Received September 28, 1893, in good condition, and mature. The must showed 26.7% of solid contents by spindle and 0.39% of acid. The bunches were small and compact; the berries small and with little color. The temperature of the must at crushing was 66°, and the maximum reached was 90°, on the fourth day. On the fifth day the wine was drawn off and fortified.

At two months the wine was bright and well constituted. It was racked and put into the heating-chamber, at a temperature of from 90° to 95°, where it was kept for three months. At two years it was a smooth and agreeable Port, with some bouquet and flavor, but not very well developed.

No. 1977. *Tinta de Madeira*, from Tulare station. A sample for must analysis was received October 16, 1893, in good condition, and mature. The bunches were rather small, conical, well filled, but not compact; berries of medium size, slightly oval, very soft, and juicy. The must showed 24.4% of solid contents by spindle and 0.42% of acid.

No. 2056. *Tinta de Madeira*, from Cupertino. A sample for must analysis was received October 30, 1893, in good condition. The bunches were small, irregular, well filled; berries small, juicy, and very ripe. The must showed 24.8% of solid contents by spindle and 0.56% of acid.

No. 2072. *Tinta de Madeira*, from Mission San José. A sample for must analysis was received November 3, 1893, in good condition. The bunches were under medium size, conical, with small wings, and well filled; the berries were small, round, pulpy, but soft and thin-skinned, and quite mature. The must showed 26.3% of solid contents by spindle and 0.44% of acid.

TINTA AMARELLA.

(See Vit. Rept. 1883-85, p. 140; 1887-89, p. 260.)

Description.—Vine a strong grower; bunches large, pyramidal or conical, heavily shouldered, close; berries medium size, but irregular, varying from very small to rather large, and from nearly round to distinctly oval; skin rather thick, but not tough; flesh firm, but juicy; flavor sweet, not marked; peduncle thick, strong, and woody; pedicels rather long and of medium strength.

The Tinta Amarella has maintained its Portuguese reputation as a heavy producer at all the stations except Amador; it requires a richer soil than that in which it is planted there. It is a good grape to plant for the bulk of a Port vineyard, but requires a certain proportion of some variety of higher quality to give it smoothness and character. It makes a good blend with Tinta de Madeira. It is unsuited to the production of dry wine, unless used in small quantities with a grape of more quality, astringency, and better keeping qualities.

ANALYSES OF MUSTS AND WINES.

TINTA AMARELLA.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body	WINE. Sugar
1890—No. 1340. Mission San José	Oct. 11	22.60	.....	.81	.30	9.20	11.45	.107	.62	.44	2.58	.....
No. 1388. Cupertino	Oct. 18	24.25	.....	.72	.....	9.92	12.36	.210	.60	.51	.....	.56
1891—No. 1442. Tulare	Aug. 26	22.90	.....	.51	.....	.....	.....	.....	.....	.....	.....	.....
No. 1457. Fresno	Aug. 28	23.70	23.13	.66	.42	13.15	16.24	.....	.56	.....	3.00	.....
No. 1486. Paso Robles	Sept. 9	21.50	.....	.61	.....	.....	.....	.....	.....	.....	.....	.....
No. 1566. Mission San José	Oct. 6	23.05	.....	.71	.....	15.50	19.08	.206	.77	.49	3.28	3.07
1892—No. 1629. Tulare	Sept. 3	20.85	20.24	.64	.45	17.17	21.09	.093	.56	.53	3.40	1.70
No. 1673. Tulare	Sept. 16	22.25	21.22	.60	.40	8.48	10.38	.096	.53	.44	3.45	.....
No. 1753. Paso Robles	Oct. 11	22.00	.....	.34	.....	.....	.....	.....	.....	.....	.....	.....
No. 1770. Mission San José	Oct. 13	21.80	21.38	.86	.....	13.85	17.08	.170	.80	.61	2.95	2.00
1893—No. 1878. Amador station	Sept. 12	18.20	.....	.78	.33	.....	.....	.....	.67	.....	.....	.....
No. 1891. Tulare	Sept. 23	23.70	21.38	.41	.48	.....	17.40	.106	.40	.....	3.40	0.50
No. 1897. Paso Robles	Sept. 26	23.70	23.61	.44	.37	.....	19.15	.150	.56	.53	3.35	1.25
No. 2059. Cupertino	Oct. 28	24.60	.....	.65	.....	.....	.....	.240	.....	.....	.....	.....
No. 2073. Mission San José	Nov. 3	23.30	21.80	.66	.31	8.98	11.18	.163	.68	.57	2.90	.....
1894—No. 2181. Amador station	Sept. 24	23.90	23.13	.54	.....	.....	.....	.089	.....	.....	.....	.....
No. 2291. Tulare	Oct. 11	24.00	23.13	.49	.....	.....	.....	.....	.....	.....	.....	.....
No. 2308. Mission San José	Oct. 13	22.20	.....	.62	.....	.....	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1340. *Tinta Amarella*, from Mission San José. Received October 14, 1890, in good condition, and mature. The must showed 22.6% of solid contents by spindle and 0.81% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 92°, on the fourth day. At the end of the fourth day the wine was dry, and was drawn off.

The wine remained turbid for some time, and was not clear one month after pressing, when it was racked for the first time; it tasted dry, however, and an examination of the lees showed no unsound germs. At six weeks it was clear, with delicate aroma, clean taste, low acid, and medium astringency. At three months, when the wine was racked for the second time, it was bright and of good quality; the lees showed no unsound germs. Two months later, however, the lees showed some short filaments and the taste of the wine was slightly affected. The wine was then pasteurized, and two months later was bright, very smooth and pleasant, with little character, but sound-tasting. At nine months it was racked for the fourth time. At fifteen months it was bright and nearly or quite mature; it showed little bouquet, but was pleasantly flavored and of agreeable astringency. Two months later it was racked and a part put in bottle; at twenty-three months the rest was bottled. Sixteen months after the second bottling both samples were bright, well flavored, but not delicate; the first bottled was not quite clean-tasting, but the other was a sound, fair wine. Two years later the wine was bright and had retained its color well, but otherwise had deteriorated, showing poor keeping qualities.

No. 1388. *Tinta Amarella*, from Cupertino. Received October 21, 1890, in good condition, and perfectly ripe. The bunches were large and well filled, and some of the berries were beginning to shrivel. The must showed 24.25% of solid contents by spindle and 0.72% of acid. The temperature of the must at crushing was 71°, and the maximum reached was 95°, on the third day. Before the wine was quite dry, six gallons were drawn off and fortified; the remainder was dry on the fourth day, when it was pressed.

At one month the wine was nearly clear, of good aroma, full astringency, and medium acid. At six weeks the lees were examined and found to be sound; the wine was clear, and was racked. At three months the wine was clear, but had a suspicious odor, and an examination of the lees showed unsound germs. The wine was pasteurized, and four months later was bright; it was rather a good wine, with little character, but without positive defect. At eight months it was racked again, and at fifteen months had improved considerably. It was bright, of light color, very little bouquet, but clean and agreeable taste. It was mature, and two months later was racked again and part put in glass; at two years the rest was bottled. Fourteen months after the second bottling both samples were bright; the first bottled was not quite clean-tasting, but the second was a good, common wine, agreeable, but not delicate. Two years later both samples were perfectly bright, but had deteriorated very much.

No. 1442. *Tinta Amarella*, from Tulare station. A sample for must analysis was received August 29, 1891, in good condition. The must showed 22.9% of solid contents by spindle and 0.51% of acid.

No. 1457. *Tinta Amarella*, from Fresno. Received August 31, 1891, in fair condition. The must showed 23.7% of solid contents by spindle and 0.66% of acid. The grapes were fermented in two equal lots. The first (No. 1457) was fermented in the ordinary way. The temperature of the grapes at crushing was 76°, and the maximum reached was 82°, on the third day. On the sixth day, when the wine was still a little sweet, it was drawn off and fortified. The second lot (No. 1457*a*) was started in the same way and at the same temperature. On the third day, when it first showed signs of vigorous fermentation, 9% of spirits of 70° strength was added. This addition of alcohol caused the fermentation to proceed more slowly, and the wine was three days longer in dropping to the required degree of sweetness. The wine was drawn off at the same time as the first lot, allowed to ferment for three days in the barrel, and was then fortified in the same way.

No. 1457. At four months the wine was bright, with good aroma, but tasted rough, a little bitter, and too dry. At five months it was racked, and placed in the heating-chamber, at from 90° to 95°, for three months. When the wine was three years old it was in excellent condition, had good aroma and clean taste, but was not quite equal to No. 1457*a*. Fourteen months later it differed little from No. 1457*a*; both were very creditable Ports, and had lost much of the rough, somewhat coarse character they had when young.

No. 1457*a*. At four months the wine was bright, somewhat raw, with a slightly bitter taste, and too dry. At five months it was racked, and placed in the heating-chamber, at a temperature of from 90° to 95°. At three years it was clear, of good aroma, some flavor, of good Port character, though somewhat coarse. Fourteen months later it had improved and become a very good, smooth Port. The color was very light.

No. 1486. *Tinta Amarella*, from Paso Robles station. A sample for must analysis was received September 11, 1891, in good condition. The must showed 21.5% of solid contents by spindle and 0.61% of acid.

No. 1566. *Tinta Amarella*, from Mission San José. Received October 9, 1891, in good condition, and mature. The must showed 23.05% of solid contents by spindle and 0.71%

of acid. The grapes were crushed at a temperature of 60°, and reached a maximum of 73° on the third day, when the wine was drawn off and fortified.

At three months the wine was clear, of full sweetness, and little flavor. A month later it was racked, and two months later put in the heating-chamber, at a temperature of from 90° to 95°, where it remained three months. At three years the wine was clear, light-colored, smooth, and agreeable, with low acid and rather too much sweetness; it was not of very marked aroma, but made a good blend with Ports of more marked character. At four years it had developed some bouquet, and was generally improved. It had a slight but not unpleasant bitterness.

No. 1629. *Tinta Amarella*, from Tulare station. Received September 6, 1892, in good condition, except for a little mold. The must showed 20.85% of solid contents by spindle and 0.64% of acid. The temperature of the grapes at crushing was 69°, and the maximum reached was 84°, on the third day. On the fourth day the wine was drawn off and fortified.

At three months the wine was bright, clean-tasting, with little color and rather too dry. Three months later it was racked for the second time and placed in the heating-chamber, at a temperature of from 90° to 95°, for three months. When the wine was two years old it was in good condition, and more highly flavored than Tinta de Madeira from the same locality. A blend of Tinta Amarella and Tinta de Madeira in equal parts was much better than either alone. Two years later it had improved very much, was very marked in character, a little bitter, but a good Port and very smooth.

No. 1673. *Tinta Amarella*, from Tulare station. Received September 19, 1892, in good condition. The grapes were very large and fine. The must showed 22.25% of solid contents by spindle and 0.60% of acid. The grapes were crushed at a temperature of 67°, and the maximum of 85° was reached on the third day. On the fourth day the wine was pressed.

The wine was clear in one month, and was racked and taken to the cellar. At three months it was bright, smooth, and pleasing, with little flavor, low acid, and medium astringency. Two months later it was in good condition, and was racked for the second time; it was of poor color. At eight months it was in good condition, clean-tasting, and pleasing. Two months later it was bright and sound, but tasted somewhat flat. At fifteen months it was in good order, but had deteriorated, and was not a success as a dry wine. A month later it was bottled. Two years after bottling the wine was bright and without deposit, but was of poor quality. It had developed something of the Port character, but was evidently a poor keeper and not to be recommended as a dry wine.

No. 1753. *Tinta Amarella*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 22.0% of solid contents by spindle and 0.34% of acid.

No. 1770. *Tinta Amarella*, from Mission San José. Received October 15, 1892, in good condition. The must showed 21.8% of solid contents by spindle and 0.86% of acid. The temperature of the grapes at crushing was 58°, and the maximum reached was 86°, on the fourth day. The wine was drawn off and fortified on the fifth day.

At one month the wine was clear, and was racked off. A month later it was bright and clean-tasting, but too dry. At five months it was racked for the second time, sweetened, and put in the heating-chamber, at a temperature of from 90° to 95°, where it was left for three months. At nine months it was bright, clean-tasting, and well developed. It requires the addition of a smoother wine; makes a good blend with No. 1771, Tinta de Madeira, and also with No. 1674, Mourisco preto. Two years later the wine was fairly good, but too acid and with little Port character. It had kept its color well.

No. 1878. *Tinta Amarella*, from Amador station. Received September 15, 1893, in good condition, but not mature. The bunches were small, the berries varying in size. The must showed 18.2% of solid contents by spindle and 0.78% of acid. There were only 26 lbs. of grapes, and they were made into Port.

At three months the wine was bright and of sufficient sweetness. An analysis showed 4.1% of solid contents and 14% of alcohol. The wine was therefore racked and refortified. Three months later it was racked again, and put into the heating-chamber, at a temperature of from 90° to 95°, for three months. Two months later it was racked again into a demijohn, on account of the small quantity. When the wine was twenty-eight months old it was bright and clean-tasting, but thin and undeveloped. It was, however, a fair wine, considering the unripe grapes from which it was made.

No. 1891. *Tinta Amarella*, from Tulare station. Received September 25, 1893, in good condition; quite mature, very sweet, a few bunches commencing to shrivel. The bunches were conico-cylindrical, slightly or not at all shouldered, compact, and the berries compressed; the berries oval, of medium size, with thick but not tough, well-colored skin, light bloom, soft flesh; the peduncles were thick, and the pedicels rather slender. The vines from which these grapes were gathered were growing in an alkaline soil. Two thirds of the row was in strongly alkaline soil, and the rest in sandy soil with less alkali. The vines were pruned half-long, and bore at the rate of about five tons per acre. The must showed 23.7% of solid contents by spindle and 0.41% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 91°, on the third day. On the third day the wine was drawn off and fortified.

At three months, when the wine was racked for the first time, it was bright and in

good order, but not quite sweet enough. At six months it was racked again and put in the heating-chamber, at a temperature of from 90° to 95°, and left there for three months. A month after taking from the heating-chamber it was racked for the third time. At twenty-eight months it was in good order, but still rough and undeveloped; a somewhat coarse Port, but promising.

No. 1897. *Tinta Amarella*, from Paso Robles station. Received September 28, 1893, in fair condition, but somewhat crushed from loose packing, and very dusty. The grapes were mixed with the same variety as the Tulare grapes. These were picked out, and the rest, which were very dusty, washed. The bunches were of medium size, fairly compact; the berries rather small and very sweet. The must showed 23.7% of solid contents by spindle and 0.44% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 84°, on the fourth day. On the fifth day the wine was drawn off and fortified.

At two months and a half the wine was racked; it was bright and too dry. At nine months it was racked again, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. A week after taking from the heating-chamber it was racked again. At twenty-eight months it was in good order, of marked character, but still raw and undeveloped.

No. 2059. *Tinta Amarella*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were of medium size, short conical, close, shouldered; the berries large, nearly round, crisp, quite ripe. The must showed 24.6% of solid contents by spindle and 0.65% of acid.

No. 2073. *Tinta Amarella*, from Mission San José. Received November 3, 1893, in good condition. The bunches were of medium size, conical, shouldered, close; the berries of medium size, round, crisp, juicy, and mature. The must showed 23.3% of solid contents by spindle and 0.66% of acid. The temperature of the grapes at crushing was 60°, and the maximum reached was 88°, on the third day. On the fourth day the wine was dry, and was drawn off.

At one month the wine was not clear and tasted a little bitter. It was racked, and at three months was bright, of good flavor, a little bouquet, good body, low acid, and still slightly bitter. A month later it was racked again, and at six months was much improved, had developed some bouquet, and was in general a pleasant wine. At nine months it was sound and in good order; a smooth, light wine, fresh and clean-tasting, but a little thin. It was racked, and a part put in bottle. At fourteen months it was in good order and mature, but not as good as at nine months. An examination of the lees showed no unsound germs, and the wine was bottled. A year after bottling the wine was bright, of fair quality, but not as good as when examined a year earlier. It had already commenced to become decrepit.

TINTA CÂO.

(See Vit. Rept. 1883–85, pp. 139, 143; 1887–89, p. 266.)

Synonym: Tinta Cam.

Description.—Leaves large, smooth, three-lobed, acuminate, irregularly saw-toothed, with rose-colored petiole, the upper side a green color with some crimson spots, the lower side very slightly downy; canes reddish-colored, bunches not very compact, but of average size and irregular; berries round, bluish-black, pedicels not visible to the end, skin tough and thick, three seeds in the berry; juice sweetish-astringent.

The opinions expressed in the last report regarding the Tinta Câo have been strengthened by subsequent results. For the hot interior valleys it is admirably suited, bearing regularly though not very heavily. It is a very healthy, strong-growing vine, and gives an excellent blending Port. It is somewhat too rough when used alone, but blended with either Tinta de Madeira, Tinta Amarella, or any mild Port variety, it is satisfactory. Blend No. 1772 shows its possibilities as an ingredient in dry red wines. It cannot be recommended for this purpose alone, but if planted for Port in a suitable locality it makes a sufficiently good dry red wine to allow of a change, if dry wine should be desired.

ANALYSES OF MUSTS AND WINES.

TINTA CÂO.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At six Months	WINE. Body	WINE. Sugar
1890—No. 1371. Cupertino	Oct. 14	23.25	.....	.52	.....	.....	.....	.....	.....	.....	.....	.....
No. 1379. Mission San José	Oct. 18	23.07	.....	1.03	.23	9.20	11.45	.222	.....	.42	2.78	.....
1891—No. 1467. Fresno	Aug. 29	22.40	21.80	.55	.60	13.77	16.98	.095	.....	.18	6.45	3.15
No. 1546. Paso Robles	Oct. 6	22.70	.....	.38	.....	.....	.....	.....	.....	.....	.....	.....
No. 1568. Mission San José	Oct. 6	21.10	.....	.78	.....	13.15	16.24	.210	.75	.50	2.70	.....
1892—No. 1697. Tulare	Sept. 27	22.40	.....	.45	.....	.....	.....	.....	.....	.....	.....	.....
No. 1732. Paso Robles	Oct. 10	23.50	.....	.50	.....	.....	.....	.....	.....	.....	.....	.....
No. 1769. Mission San José	Oct. 13	22.80	21.80	.97	.....	14.82	18.25	.120	.82	.60	4.20	.....
No. 1772.* Mission San José	Oct. 13	.....	.....	.63	.....	8.84	11.00	.196	.63	.63	2.80	.....
1893—No. 1849. Amador station	Sept. 12	20.60	19.41	.79	.30	.....	.....	.....	.55	.....	.....	.....
No. 1920. Paso Robles	Oct. 10	24.60	23.61	.56	.34	.....	17.00	.100	.52	.69	3.32	0.88
No. 1975. Tulare	Oct. 14	22.60	.....	.71	.....	.....	.....	.413	.69	.....	.....	.....
No. 2051. Cupertino	Oct. 30	24.60	.....	.72	.....	.....	.....	.246	.....	.....	.....	.....
1894—No. 2167. Amador station	Sept. 19	25.40	23.61	.48	.....	.....	.....	.....	.48	.....	.....	.....
No. 2275. Mission San José	Oct. 5	20.20	.....	.71	.....	.....	.....	.166	.65	.....	.....	.....
No. 2338. Tulare	Oct. 19	26.50	.....	.40	.....	.....	.....	.....	.....	.....	.....	.....

*Blend of the Tinta Cão, Tinta de Madeira, and Tinta Amarella.

RECORD OF TREATMENT.

No. 1371. *Tinta Câo*, from Cupertino. A sample for must analysis was received October 17, 1890, in fair condition, a few of the berries being moldy. The must showed 23.25% of solid contents by spindle and 0.52% of acid.

No. 1379. *Tinta Câo*, from Mission San José. Received October 20, 1890, in good condition, and mature. The bunches and berries were very small. The must showed 23.07% of solid contents by spindle and 1.03% of acid. The temperature of the grapes at crushing was 68°, and the maximum reached was 90°, on the third day. On the fourth day the wine was dry, and was drawn off.

At one month the wine was nearly clear, and showed high acid and astringency, but the odor was not good and it was not clean-tasting. The lees were examined under the microscope, and as no unsound germs were found the wine was racked and taken to the cellar. At three months the lees were examined again and showed unsound germs. The wine was bright, and the flavor had improved, but the odor was still suspicious, so it was pasteurized. Three months after pasteurizing it was bright, had much improved in bouquet, and the disagreeable odor had almost disappeared. At this time it was racked for the third time, and at fourteen months it was clear, but had deteriorated. Two months later it was bottled, but did not keep well. Two years after bottling it showed some good qualities, but was not clean-tasting.

No. 1467. *Tinta Câo*, from Fresno. Received August 31, 1891, in good condition. The must showed 22.4% of solid contents by spindle and 0.55% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 81°, on the third day. On the fourth day it was drawn off, and on the fifth day fortified.

At four months the wine was clear, of good flavor, but slightly bitter; it was of poor color and too dry. A month later it was racked, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At fourteen months it was racked again. At three years it was very much reduced by evaporation, on account of the thinness of the keg; it was not quite clear, but possessed good flavor and aroma and the right amount of sweetness. It was a good Port, but rather coarse and with a slight bitterness. Fourteen months later it had improved and was a Port of marked character, not very delicate, but excellent as a blend to give character to more neutral wines.

No. 1546. *Tinta Câo*, from Paso Robles station. A sample for must analysis was received October 8, 1891, in good condition, and mature. The bunches were very small; the berries also very small and seedy. The must showed 22.7% of solid contents by spindle and 0.38% of acid.

No. 1568. *Tinta Câo*, from Mission San José. Received October 9, 1891, in good condition, and mature. The must showed 21.1% of solid contents by spindle and 0.78% of acid. The temperature of the grapes at crushing was 60°, and the maximum reached was 84°, on the fourth day. On the fifth day the wine was drawn off, and on the sixth fortified.

At three months the wine was clear, but tasted too acid and was too dry. A month later it was racked, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At one year it was racked for the third time. At three years the wine was in good order, but was a thin, poor wine, with very little Port character; on account of the small quantity, it was put in a demijohn. Fourteen months later it had improved, and had developed some bouquet. It was rather thin, but was otherwise a good Port.

No. 1697. *Tinta Câo*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 22.4% of solid contents by spindle and 0.45% of acid.

No. 1732. *Tinta Câo*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 23.5% of solid contents by spindle and 0.50% of acid.

No. 1769. *Tinta Câo*, from Mission San José. Received October 15, 1892, in good condition. The must showed 22.8% of solid contents by spindle and 0.97% of acid. The temperature of the grapes at crushing was 58°, and the maximum reached was 80°, on the fourth day. On the fifth day the wine was drawn off and fortified.

The wine was clear at three weeks after pressing, and was racked at one month. At two months it was bright and clean-tasting, but too dry and with little Port character. It was racked again, and two months later sweetened and refortified. At twelve months it was racked again and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. A year later it was sound and in good order, but was not an agreeable wine; it was too acid and rough, and had little of the Port character. Thirteen months later it had improved, was of good color, and had developed some bouquet; it was, however, much less marked in character than the Tinta Câo from Tulare.

No. 1772. A blend was made of the grapes of Nos. 1769, 1770, and 1771, in the proportions of Tinta Câo, 21.4%; Tinta Amarella, 57.2%; Tinta Madeira, 21.4%. The temperature of the grapes at crushing was 58°, and the maximum reached was 92°, on the fifth day. The wine was dry on the sixth day, and was drawn off.

At three weeks the wine was quite dry and nearly clear. It was racked, and in three months was bright, of good flavor and some bouquet, fresh-tasting, with full acid and medium astringency. Three months later it was racked again, being in good condition and improved in character. At eight months it was in good order, and showed excellent promise. Two months later it still tasted a little raw, but was of good bouquet and

clean-tasting. At four months it had improved, but was not mature. At eighteen months it was bottled. Twenty months after bottling the wine was bright, without deposit, good, sound, and of neutral character, of good color, acid, and astringency. A good table wine, but not of high quality.

No. 1849. *Tinta Cão*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The bunches were small and loose; the berries small and not quite mature. The must showed 20.6% of solid contents by spindle and 0.79 % of acid.

No. 1920. *Tinta Cão*, from Paso Robles station. Received October 12, 1893, in good condition. The bunches were small and rather loose, no coulure; the berries small, round, well-colored, fleshy, mature. The must showed 24.6% of solid contents by spindle and 0.56% of acid. The temperature of the grapes at crushing was 69°, and they were fermented for four days, when they were pressed and the wine fortified while still a little sweet.

At two months the wine was bright and a little too dry. It was racked at this date, and again six months later, when it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. It was racked a week after taking from the heating-chamber. At twenty-seven months it was bright, of full Port flavor, but still rough and undeveloped.

No. 1975. *Tinta Cão*, from Tulare station. A sample for must analysis was received October 16, 1893, in good condition. The bunches were very small, loose, shortly conical; berries very small, round, thick-skinned, mature, except for some second-crop bunches. The must showed 22.6 % of solid contents by spindle and 0.71% of acid.

No. 2051. *Tinta Cão*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition, mature, and very sweet. The bunches were small, branching, and well filled; the berries small, firm, and juicy. The must showed 24.6% of solid contents by spindle and 0.72% of acid.

MOURISCO PRETO.

(See Vit. Rept. 1883–85, p. 140; 1887–89, p. 265.)

Synonyms: Mourisco tinto do Douro; Nova Rei.

Description.—Trunk vigorous, with thick and but slightly adherent bark, which is not much ribboned. The growth starts regularly after the middle of March; the young shoots are but slightly pubescent and of a light color. The canes are strongly inclined, short, with internodes averaging about 3, but occasionally as much as $4\frac{3}{4}$ inches; nodes small and somewhat flattened. Color of bark, light brown and uniform; wood hard, with little pith. Leaves large, of uniform size, almost round; some five-lobed, with the lateral sinuses but slightly open, while the basal one is widely open; margin with large but rather obtuse teeth. The upper surface of the leaf is smooth, glabrous, brightly and uniformly green; the lower surface is a little rough, hardly pubescent, pale green, and the principal veins strongly marked. Petiole medium length, thick, smooth, whitish-green. Bunches numerous, mostly large, sometimes very large, pyramidal in form, more or less branched; peduncle large, thick, rather soft, light or yellowish green. Berries large, almost uniform in size, regular, flattened, and umbilicate, dull black, adhering strongly to the pedicels, which are long and nearly smooth; flesh quite firm, skin thick, juice sweet and very agreeable. It yields about 55% of juice. It matures late in the second period.

The Mourisco preto was for a time considered as resistant to the attacks of phylloxera, but, like the Flame Tokay, it soon proved to be only partially and insufficiently so. It is a very vigorous, healthy vine, and one of the most promising Port varieties so far tested in California. It bears well and produces a good Port, both at Tulare and Paso Robles, being for this purpose superior to the Tinta Amarella. It attains a good amount of sugar, and is marked by low acid and low tannin. It is quite unsuited for dry wines, but the composition of the must and the general character of the grape render it eminently fitted for Port.

ANALYSES OF MUSTS AND WINES.

	MOURISCO PRETO.	Date of Picking	MUST.				WINE.						
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At Six Months	Body	Sugar
1892—No. 1674.	Tulare	Sept. 20	22.40	22.67	.32	.39	14.55	17.92	.083	.41	.....	3.61	1.75
1893—No. 1923.	Paso Robles	Oct. 10	25.40	24.12	.47	.42	9.20	11.45	.....	.50	.41	2.30	.....
No. 1968.	Tulare	Oct. 14	23.90	23.13	.47	.56	.....	18.30	.066	.45	.49	3.26	.34
1894—No. 2185.	Amador station	Sept. 24	25.20	.....	.44	.....	.....	.....	.....	.....	.....	.....	.....
No. 2221.	Tulare	Oct. 15	25.00	.....	.51	.....	.....	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1674. *Mourisco preto*, from Tulare station. Received September 21, 1892, in good condition, and mature. The must showed 22.4% of solid contents by spindle and 0.32% of acid. The temperature of the grapes at crushing was 67°, and the maximum reached was 82°, on the third day. The wine was drawn off on the fifth day, while still a little sweet, and fortified.

In six weeks the wine was clear, and in two months bright. It showed a good Port flavor, but was rather too dry. At five months it was sweetened, refortified, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. A month after taking from the heating-chamber it was in good condition, of good flavor and very decided Port aroma. It made an excellent blend with one half Tinta de Madeira. When the wine was two years old it was in good condition, a somewhat coarse, heavy-flavored Port, requiring blending with a neutral or more delicate wine. Thirteen months later it had improved, was of good color, had become smoother, and developed a good bouquet.

No. 1923. *Mourisco preto*, from Paso Robles station. Received October 12, 1893, in good condition, quite mature, but not shriveled. The bunches were small, irregular, rather loose; the berries small, round, fleshy, with little juice. The must showed 25.4% of solid contents by spindle and 0.47% of acid. The grapes were crushed at a temperature of 69°, and fermented for four days, when they were fortified while still a little sweet.

In one month the wine was bright, but was rather too dry. At five months it was racked for the second time, and placed in the heating-chamber, at a temperature of from 90° to 95°, for three months. It was racked again two months after taking from the heating-chamber. At twenty-seven months it was not bright, was rough, and still tasted raw; it was of poor color, but had a good and full Port aroma.

No. 1968. *Mourisco preto*, from Tulare station. Received October 16, 1893, in good condition, but some were not quite mature. The bunches were conical, shouldered, and loose; the berries of medium size and nearly round. The must showed 23.9% of solid contents by spindle and 0.47% of acid. The grapes were crushed at a temperature of 68°, and reached a maximum of 78° on the second day. On the third day the wine was drawn off, and on the fifth day was fortified.

At one month the wine was racked; it was bright and too dry. At eight months it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months At eleven months it was racked for the third time. At twenty-seven months it was bright, of poor color, too dry and still raw, but of full Port aroma and promising.

MISSION.

Description.—Vine vigorous and a heavy grower; leaves of medium size, shiny green and glabrous above, downy below, barely lobed, acutely toothed, on reddish petioles; bunches large, pyramidal, spreading, loose; berries of medium size, round, crisp, brownish-red.

The suggestion of Mr. Charles A. Wetmore that the Mission is the same as the Monica, the most valued grape of Sardinia, is interesting, but we believe not quite correct. The Monica has been cultivated at the Experiment Stations for four years, but has only fruited once. It can be distinguished at first glance from the Mission by the yellowish-green of its foliage and the decided pink of the tips of the growing shoots. The young leaves are more deeply bronzed, and the older leaves are more densely woolly (tomentose) below, and lose the down of the upper surface more slowly. The grapes as grown at Tulare are much larger, finer, and of more agreeable flavor than those of the Mission grape. With these exceptions there is certainly a very close resemblance between the varieties, which shows that they are very closely connected. It is possible that years of cultivation and unconscious selection in California may be the cause of the differences, but we think it more probable that the Mission is a seedling of the Monica. There is little to be said in favor of our old, rejected friend, the Mission, except that it may still be useful in some localities as an ingredient in Sherries. Its total lack of character and low acid render it unfit for any other purpose than blending where a neutral ingredient is desired.

ANALYSES OF MUSTS AND WINES.

MISSION.	Date of Picking	MUST.				WINE.						
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight.	Alcohol. By Volume.	Tannin	Total Acid as Tartaric. At Pressing.	Total Acid as Tartaric. At Six Months.	Body	Sugar
1890—No. 1256. Amador station	Sept. 23	22.20	.....	.44	.31	9.56	11.91	.168	.40	.38	2.52	.....
1892—No. 1692. Tulare	Sept. 26	25.90	.....	.38	.....	.....	.....	.....	.....	.....	.....	.....
No. 1720. Paso Robles	Oct. 10	23.25	23.13	.42	.....	16.31	20.06	.....	.37	.....	2.57	2.23
1893—No. 1870. Amador station	Sept. 12	20.40	.....	.48	.....	.....	.....	.154	.68	.....	.....	.....
No. 1978. Tulare	Oct. 19	26.30	25.53	.38	.57	8.98	11.18	.....	.39	.42	2.45	.....

COLOR READINGS.

MISSION.	At Pressing.	One Month.	Two Months.	Three Months.
1890—No. 1256. Amador station	11.1 VR+2Y	4.8 3R+2Y	4.9 1R+2Y	*
1893—No. 1870. Amador station	12.3 1VR+1Y	10.7 2VR+1Y	.....	.....

*Too light for instrument.

RECORD OF TREATMENT.

No. 1256. *Mission*, from Amador station. Received September 26, 1890, in good condition. The bunches were of medium size, pyramidal and loose, with small shoulders; berries medium to small, round, not quite mature. The must showed 22.2 % of solid contents by spindle and 0.44 % of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 77°, on the fifth day. On the seventh day the wine was drawn off, though it was still very sweet.

Three weeks after pressing it showed no signs of fermentation, but was still turbid and contained 3 % or 4 % of sugar. A month later it was still cloudy, and the lees were full of elongated yeast cells, but no unsound germs were observed. The wine was without color, nearly dry, tasteless, and flat. It was racked, and a month later the lees showed unsound germs. The taste of the wine was not affected. It was cloudy, but quite dry and improved in taste. It was pasteurized, but did not improve, and four months later it was cloudy, coarse, and insipid. After this it became gradually worse, and never became quite clear.

No. 1692. *Mission*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 25.9 % of solid contents by spindle and 0.38 % of acid.

No. 1720. *Mission*, from Paso Robles station. Received October 13, 1892, in good condition. The must showed 23.25 % of solid contents by spindle and 0.42 % of acid. The temperature of the grapes at crushing was 68°, and the maximum reached was 74°, on the fourth day. The wine was drawn off on the fourth day and fortified.

At one month the wine was clear, and was racked. At ten weeks it was bright, and was racked; it was clean-tasting, but too sweet. Two months later it was refortified. When twelve months old it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years it was in good order; it was a fair Sherry, but too sweet and without much character. Thirteen months later it had improved very much; it was a good, clean-tasting Sherry, rather too sweet, and without much aroma, but very pleasing.

No. 1870. *Mission*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The bunches were large and loose; the berries uneven in size and degree of ripeness. The must showed 20.4 % of solid contents by spindle and 0.48 % of acid.

ALEATICO.

Synonym: Uva liatica.

Description.—Vine fairly vigorous and productive in warm locations; leaves longer than wide, glabrous on both sides, irregularly and sharply dentate, the upper sinuses well marked, the lower shallow or absent, on reddish petioles; bunches over medium size, winged, compact when not coulured, on thick peduncles; berries of medium size, round, crisp, and juicy, on thick pedicels; skin reddish-purple, tough. The grapes have a very delicate and agreeable Muscat flavor.

The finest red "vins de liqueur" of Tuscany and Piedmont are made from this variety. It is often blended with other varieties for this purpose, but even when used alone its Muscat flavor is delicate and agreeable. The wine has a fuller astringency than that of other black Muscats, which takes away the somewhat nauseating effect characteristic of many Muscat wines. The vine bears well and ripens its crop early at Tulare, where, however, the grapes easily dry up if not gathered in time. The grapes attain a high percentage of sugar in all localities tested, and maintain their acid well. The grapes from Tulare, which are the only ones which have been tested for wine, make an agreeable and delicate "vin de liqueur."

ANALYSES OF MUSTS AND WINES.

ALEATICO.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At Six Months	WINE. Body	WINE. Sugar
1890—No. 1368. Cupertino	Oct. 14	29.50	.....	.74	.....	.....	.....	.....	.....	.....	.....	....
1891—No. 1548. Paso Robles	Oct. 6	24.70	.....	.44	.....	.....	.....	.....	.....	.....	.....	.....
1892—No. 1631. Tulare	Sept. 3	27.80	27.13	.41	.48	14.91	18.36	.....	.42	.52	5.80	2.40
No. 1724. Paso Robles	Oct. 10	25.75	.....	.50	.....	.....	.....	.....	.....	.....	.....	.....
1893—No. 1796. Tulare	Aug. 29	24.35	23.13	.75	.30	13.86	17.92	.....	.54	.....	6.70	4.00
No. 1851. Amador station	Sept. 13	22.20	20.99	.63	.26	13.34	17.08	.125	.59	.62	4.15	1.41
No. 1933. Paso Robles	Oct. 12	26.60	26.31	.53	.31	.....	.....	.311	.....	.....	.....	.....
No. 2133. Cupertino	Nov. 5	30.00	.....	.62	.....	.....	.....	.266	.....	.....	.....	.....
1894—No. 2148. Tulare	Sept. 11	24.40	.....	.60	.....	.....	.....	.....	.....	.....	.....	.....

COLOR READINGS.

ALEATICO.	At Pressing.		One Month.		Two Months.		Three Months.	
1892—No. 1631. Tulare	11.4	VR+Y	4.6	VR+2Y	.....	.....	.....	.....
1893—No. 1851. Amador station	20.8	5VR	16.0	VR+Y	9.8	YY	8.7	YY
No. 1933. Paso Robles	11.8	3R	.....	.....	.....	.....	.....	.....
No. 2133. Cupertino	72.8	2VR	.....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 1368. *Aleatico*, from Cupertino. A sample for must analysis arrived October 17, 1890, in fair condition. The grapes were somewhat overripe and shriveled; the bunches were of average size, conical, winged, loose, on thick, woody peduncles; the berries round, of medium size, on short but strong pedicels, skin tough, flesh crisp and juicy. The must showed 29.5% of solid contents by spindle and 0.74% of acid.

No. 1548. *Aleatico*, from Paso Robles station. A sample for must analysis arrived October 18, 1891, in good condition. The bunches were of medium size, well filled with fair-sized berries; the latter highly flavored and mature. The must showed 24.7% of solid contents by spindle and 0.44% of acid.

No. 1631. *Aleatico*, from Tulare station. Received September 6, 1892, in good condition but commencing to dry up. The must showed 27.8% of solid contents by spindle and 0.41% of acid. The grapes were crushed at a temperature of 69°, and reached a maximum of 81° on the third day. The wine was drawn off on the fourth day while still fermenting and very sweet, and was fortified on the fifth day.

In two weeks after pressing the wine was clear, and was racked. At three months it was racked for the second time; it was bright, of fair quality, and with slightly Muscat aroma. Three months later it was sweetened and fortified a little more; it was then put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At seven months it had not shown much development. At two years it had improved, and was a very good red sweet wine, of delicate Muscat aroma and clean taste. Eleven months later it had improved, was bright and very smooth and agreeable.

No. 1724. *Aleatico*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The berries were rather large for this variety. The must showed 25.75% of solid contents by spindle and 0.50% of acid.

No. 1796. *Aleatico*, from Tulare station. Received August 31, 1893, in fair condition. The bunches were over medium in size, rather compact. The grapes, which were of slightly Muscat flavor, were crushed for white wine. The must showed 24.35% of solid contents by spindle and 0.75% of acid. The temperature of the must at crushing was 63°, and the maximum reached was 84°, on the fifth day. On the fifth day, when the wine was still a little sweet, it was fortified.

At three months the wine was bright, well flavored, and very sweet. It was racked, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At one year it was racked for the third time. At two years and five months it was bright, of delicate and pleasing Muscat aroma and golden color; a very good "vin de liqueur."

No. 1851. *Aleatico*, from Amador station. Received September 15, 1893, in good condition. The must showed 22.2% of solid contents by spindle and 0.63% of acid. The grapes were crushed, and fermented in the heating-chamber, at a temperature of from 80° to 85°, for five days, when the wine was drawn off and fortified.

At three months the wine was bright and of sufficient sweetness; it was racked and put in the heating-chamber for three months, at a temperature of from 90° to 95°. At eleven months it was racked for the second time. At twenty-seven months it was not quite clear, of agreeable but not marked Muscat aroma, good, clean taste, but rougher and less developed than the Aleatico from Tulare.

No. 1933. *Aleatico*, from Paso Robles station. A sample for must analysis was received October 13, 1893, in fair condition. The bunches were loose, straggling, much coulured and sunburned; the berries irregular in size, of good flavor, and mature. The must showed 26.6% of solid contents by spindle and 0.53% of acid.

No. 2133. *Aleatico*, from Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were of medium size, conical, close; the berries mostly dried up to raisins. The must showed 30.0% of solid contents by spindle and 0.62% of acid.

MOSCATELLO FINO.

Synonym: Moscatello nero.

Description.—Leaves of medium size, with deep upper and shallow lower sinuses, glabrous above, slightly downy below, and very hairy on the veins, teeth long and sharp; bunches large to very large, long, loose, conico-cylindrical, and winged; berries very large, on long, thin pedicels; skin well colored, thin but tough; flesh soft and juicy, with delicate Muscat aroma.

This variety is of excellent promise as a table-grape. It is a heavy bearer, and produces very fine-looking bunches of dark-colored grapes. It is rather late in bearing, and does not stand the weather very well.

ANALYSES OF MUSTS AND WINES.

MOSCATELLO FINO.	No. 1310. Cupertino.	No. 1919. Tulare.
Date of picking	Oct. 8, 1890	Oct. 7, 1893
Must.		
Solid contents by spindle	21.70	23.30
Acid as tartaric	.63	.53
Ash	.24	.40
Wine.		
Alcohol by weight	14.09	16.08
Alcohol by volume	17.37	19.78
Acid at pressing	.60	.59
Acid at six months	.50	.43
Tannin	.157	.131
Body	3.54	4.20
Sugar	.47	1.37

RECORD OF TREATMENT.

No. 1310. *Moscatello fino*, from Cupertino. Received October 10, 1890, in good condition, except for a few bunches which had commenced to mold. The bunches were large, long, loose, winged, on long, thin, tough peduncles; the berries were very large, but irregular in size, slightly oval, on long, thin pedicels; the skin was thin, black, and rather tough; the flesh soft and juicy. The grapes were mature, and the must showed 21.7% of solid contents by spindle and 0.63% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 81°, on the third day. On the third day the wine was drawn off and fortified.

At three months the wine was bright, of agreeable Muscat aroma and flavor, sweetness and alcoholic strength adequate. A week later it was racked and put in the heating-chamber, at a temperature of 100°, for three months. At eight months the wine was not in very good condition, but showed very good flavor. It was racked for the third time, and at sixteen months was clear, with strong and pleasing aroma, but too low in body and too high in acid. It was racked again at this time, but had deteriorated. At two years the wine showed some good qualities, but was rather thin. At this date it was put in glass.

No. 1919. *Moscatello fino*, from Tulare station. Received October 9, 1893, in good condition. The bunches were very irregular and varying in size, well filled, but not compact; the berries uneven in size, varying from very large to medium. The coloring was uneven, some berries being dark-colored, firm, crisp, and well flavored, others light-colored, soft, and flat-tasting. The must showed 23.3% of solid contents by spindle. The temperature of the grapes at crushing was 67°, and the maximum reached was 82°, on the second day. On the third day the wine was drawn off and fortified.

At two months the wine was bright and agreeable; it was racked for the second time, and put in the heating-chamber, at a temperature of 95°, for three months. At nine months it was racked again. At two years and a half the wine was in good condition; it was well developed, of light rose color, delicate Muscat flavor and aroma, clean-tasting, but rather light-bodied.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF PORT TYPE.

Number	LOCALITY.	Vintage of	MUST.				WINE.*		
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Tannin	Acid at Pressing	Acid at Six Months
	Tinta de Madeira.								
1247	Fresno	1890	24.80	24.22	.50	.43	.126	.45	.38
1459	Fresno	1891	24.80	.....	.57	.....	.225	.53	.47
1363	Cupertino	1890	27.45	.....	.54	.35	.164	.56	.53
2056	Cupertino	1893	24.80	.....	.56	.....	.320	.....	.....
1301	Mission San José	1890	23.70	.....	.52	.30	.241	.53	.38
1567	Mission San José	1891	24.53	.....	.48	.....	.270	.65	.43
1771	Mission San José	1892	23.05	22 67	.56	.....	.136	.63	.50
2072	Mission San José	1893	26.30	25.76	.44	.27	.....	.....	.....
2255	Mission San José	1894	22.60	.....	.44	.....	.237	.....	.....
1487	Paso Robles	1891	21.50	.....	.48	.....	.....	.....	.....
1651	Paso Robles	1892	25.86	.....	.59	.....	.....	.....	.....
1896	Paso Robles	1893	26.70	26.31	.39	.37	.115	.38	.41
1630	Tulare	1892	23.70	.....	.42	.....	.126	.50	.44
1977	Tulare	1893	24.40	.....	.42	.40	.....	.38	.....
2337	Tulare	1894	25.90	.....	.39	.....	.....	.....	.....
1850	Amador station	1893	23.90	21.38	.56	.33	.096	.56	.68
2146	Amador station	1894	26.50	.....	.48	.....	.....	.....	.....
	Average, Fresno	.....	**24.80**	**24.22**	**.53**	**.43**	**.176**	**.49**	**.43**
	Average, Cupertino	.....	**26.12**	.....	**.55**	**.35**	**.242**	**.56**	**.53**
	Average, Mission San Jose	.....	**24.03**	**24.21**	**.48**	**.28**	**.221**	**.60**	**.43**
	Average, Paso Robles	.....	**24.68**	**26.31**	**.73**	**.37**	**.115**	**.38**	**.41**
	Average, Tulare	.....	**24.66**	.....	**.40**	**.40**	**.126**	**.44**	**.44**
	Average, Amador station	.....	**25.20**	**21.38**	**.52**	**.33**	**.096**	**.56**	**.68**
	Tinta Amarella.								
1388	Cupertino	1890	24.25	.....	.72	.....	.210	.60	.51
2059	Cupertino	1893	24.60	.....	.65	.....	.240	.....	.....
1340	Mission San José	1890	22.60	.....	.81	.30	.107	.62	.44
1566	Mission San José	1891	23.05	.....	.71	.....	.206	.77	.49
1770	Mission San José	1892	21.80	21.38	.86	.....	.170	.80	.61
2073	Mission San José	1893	23.30	21.80	.66	.31	.163	.68	.57
2308	Mission San José	1894	22.20	.....	.62	.....	.....	.....	.....
1442	Tulare	1891	22.90	.....	.51	.....	.....	.....	.....
1629	Tulare	1892	20.85	20.24	.64	.45	.093	.56	.53
1673	Tulare	1892	22.25	21.22	.60	.40	.096	.53	.44
1891	Tulare	1893	23.70	21.38	.41	.48	.106	.40	.....
2291	Tulare	1894	24.00	23.13	.49	.....	.....	.....	.....
1457	Fresno	1891	23.70	23.13	.66	.42	.....	.56	.....
1486	Paso Robles	1891	21.50	.....	.61	.....	.....	.....	.....
1753	Paso Robles	1892	22.00	.....	.34	.....	.....	.....	.....
1897	Paso Robles	1893	23.70	23.61	.44	.37	.150	.56	.53
1878	Amador station	1893	18.20	.....	.78	.33	.....	.67	.....
2181	Amador station	1894	23.90	23.13	.54	.....	.089	.....	.....
	Average, Cupertino	.....	**24.42**	.....	**.68**	.....	**.225**	**.60**	**.51**
	Average, Mission San Jose	.....	**22.39**	**21.59**	**.73**	**.31**	**.162**	**.72**	**.53**
	Average, Tulare	.....	**22.74**	**21.49**	**.53**	**.44**	**.098**	**.50**	**.49**
	Average, Paso Robles	.....	**22.10**	**23.61**	**.46**	**.37**	**.150**	**.56**	**.53**
	Average, Amador station	.....	**21.05**	**23.13**	**.66**	**.33**	**.089**	**.67**	.....

SUMMARY OF ANALYSES OF MUSTS AND WINES OF PORT TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST.				WINE.*		
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Tannin	Acid at Pressing	Acid at Six Months
	Tinta Cão.								
1371	Cupertino	1890	23.25		.52				
2051	Cupertino	1893	24.60		.72		.246		
1379	Mission San José	1890	23.07		1.03	.23	.222		.42
1568	Mission San José	1891	21.10		.78		.210	.75	.50
1769	Mission San José	1892	22.80	21.80	.97		.120	.82	.60
2275	Mission San José	1894	20.20		.71		.166	.65	
1467	Fresno	1891	22.40	21.80	.55	.60	.095		.18
1546	Paso Robles	1891	22.70		.38				
1732	Paso Robles	1892	23.50		.50				
1920	Paso Robles	1893	24.60	23.61	.56	.34	.100	.52	.69
1697	Tulare	1892	22.40		.45				
1975	Tulare	1893	22.60		.71		.413	.69	
2338	Tulare	1894	26.50		.40				
1849	Amador station	1893	20.60	19.41	.79	.30		.55	
2167	Amador station	1894	25.40	23.61	.48			.48	
	Average, Cupertino		**23.92**		**.62**		**.246**		
	Average, Mission San Jose		**21.79**	**21.80**	**.80**	**.23**	**.180**	**.74**	**.51**
	Average, Paso Robles		**23.60**	**23.61**	**.48**	**.34**	**.100**	**.52**	**.69**
	Average, Tulare		**23.83**		**.52**		**.413**	**.69**	
	Average, Amador station		**23.00**	**21.51**	**.63**	**.30**		**.52**	
	Mourisco preto.								
1674	Tulare	1892	22.40	22.67	.32	.39	.083	.41	
1968	Tulare	1893	23.90	23.13	.47	.56	.066	.45	.49
2321	Tulare	1894	25.00		.54				
1923	Paso Robles	1893	25.40	24.12	.47	.42		.50	.41
2185	Amador station	1894	25.20		.44				
	Average, Tulare		**23.76**	**22.90**	**.44**	**.47**			
	Mission.								
1720	Paso Robles	1892	23.25	23.13	.42			.37	
1692	Tulare	1892	25.90		.38				
1978	Tulare	1893	26.30	25.53	.38	.57		.39	.42
1256	Amador station	1890	22.20		.44	.31	.168	.40	.38
1870	Amador station	1893	20.40		.48		.154	.68	
	Average, Tulare		**26.10**	**25.53**	**.38**	**.57**	**.074**	**.43**	**.49**
	Average, Amador station		**21.30**		**.46**	**.31**			
	Aleatico.								
1368	Cupertino	1890	29.40		.74				
2133	Cupertino	1893	30.00		.62		.266		
1548	Paso Robles	1891	24.70		.44				
1724	Paso Robles	1892	25.75		.50				
1933	Paso Robles	1893	26.60	26.31	.53	.31	.311		
1631	Tulare	1892	27.80	27.13	.41	.48		.42	.52
1796	Tulare	1893	24.35	23.13	.75	.30		.54	
2148	Tulare	1894	24.40		.60				
1851	Amador station	1893	22.20	20.99	.63	.26	.125	.59	.62
	Average, Cupertino		**29.70**		**.68**		**.266**		
	Average, Paso Robles		**25.68**	**26.31**	**.49**	**.31**	**.311**		
	Average, Tulare		**25.51**	**25.13**	**.58**	**.39**		**.48**	**.52**
	Moscatello fino.								
1310	Cupertino	1890	21.70		.63	.24			
1919	Tulare	1893	23.30		.53	.40			

*Fortified.

SHERRY TYPE.

It is perhaps incorrect to speak of "California Sherries," for little or no wine of the true Sherry type is made in California. The celebrated wines of Jerez, except for limited quantities of "vinos dulces," are almost or quite dry, and made by processes essentially different from those practiced in California. The finest Spanish Sherries are fortified to a very limited extent, and contain only from 13% to 15% of alcohol after fortifying. They are made from very ripe or slightly dried grapes, which are crushed, fermented for two or three months, and racked before the addition of alcohol. Often a little "vino dulce," or sweet wine, is added later—enough to destroy any harshness, but not enough to cause the wine to be classed properly as "sweet." Sherries, so called, as made in California, are, on the contrary, always sweet and in general *very* sweet. They would more properly be called Sweet Madeira, the type to which they most closely approach. They are, in fact, what the French call sweet "vins de liqueur," of which an almost infinite variety is made in various vine-growing parts of the world. All these "vins de liqueur," though exhibiting a wonderful variety of qualities, have certain characteristics in common. They all possess low acidity, have more or less of a peculiar taste known as the "rancio," "gout de rance," and sometimes improperly as the "Sherry taste," and generally contain a certain quantity of unfermented sugar and a high percentage of alcohol.

The cause of this "rancio" taste has been the subject of much controversy and experiment. The tendency to impute all changes in wine to the action of some micro-organism led to the belief that the action of some ferment was responsible for the production of this taste in wines. It has now, however, been conclusively proved that it is due simply to chemical oxidation of the sugar and other organic constituents of the wine, without the presence, necessarily, of any living organism. Wines and syrups have been caused to acquire the "rancio" taste while being kept perfectly sterilized by the most careful precautions. It is, therefore, incorrect to call this the "Sherry taste," as it is common to many wines besides those of Jerez. The characteristic flavors of these, which could properly be called the "Sherry taste," are due to peculiarities of soil, variety of grape, and processes of manufacture, and can only be approximated outside of the Jerez district, while the "rancio" taste can be given to almost any wine in any locality by appropriate methods.

For the production of good "vin de liqueur" two qualities are essential in the grapes: they must be high in sugar and very low in acid. These conditions are constantly possible only in hot localities and with certain varieties of grapes. The great valley of California and the Sierra foothills are especially adapted to the production of these wines, and with proper varieties (the grapes of Andalusia, especially) excellent results can be and have been obtained. For the best results the must should show at least 24% of solid contents by spindle, and should not exceed 4 pro mille of acid. With the right varieties and proper treatment of the vines these conditions can perhaps always be fulfilled over a large part of California, without the trouble and expense of resorting to the European practice of exposing the gathered grapes to a partial evaporation in the sun before crushing. For the production of the commoner grades the addition of de-acidified grape syrup is the simplest and best method of increasing the sugar contents to the requisite stand-

ard. The fermentation should be carefully watched, in order that the wine may be racked and fortified with the desired amount of sugar, and before any danger of secondary fermentation arises. The oxidation and the acquirement of "rancio" are governed by time, temperature, and access of air. The higher the temperature and the fuller the access of air, the more rapidly does the wine acquire this taste. Within certain limits, however, the slower the oxidation the more delicate the resulting flavors. The common practice of heating the wine to a very high temperature for a short time cannot produce high-class wines. The best method is to mature the wine in a warm cellar, or heat for several months at a temperature not exceeding 100° F.

The Palomino, Pedro Jimenes, Perruno, Mourisco branco, and Mantuo de Pilas have all grown well, given good crops, and produced good wine in the lower San Joaquin Valley. They are much improved, however, by an addition of Verdelho or Boal, which bear much less, but possess higher quality and more pronounced flavor. A mixture, therefore, of two thirds of one or two varieties of the former group, with one third of Verdelho or Boal seems at present to be the best choice of varieties that can be made in that district for the production of sweet wines. Grenache and Mission have also given good results where they do not attain too much color, and could doubtless be well used to blend with the others, especially with the addition of a little Verdelho.

The Malmsey is also very promising as a variety to be used in small quantities to give character. It has a delicate aroma—that of the true Malvoisies—resembling Muscat, but more delicate and more suitable for sweet wines.

The Doradillo, one of the most esteemed grapes of Malaga and Granada, has been tried to a limited extent at the Eisen vineyard at Fresno, and has proved a strong grower and heavy bearer. It has apparently all the requisites for the making of a good sweet wine, but has not yet been thoroughly tested.

The Furmint, or true Tokay grape, has been tried at the same vineyard, and has produced some good wine, but it would probably give better results in the foothills.

The only varieties which seem at all promising for the production of sweet wines in the cooler localities are the Palomino and the Verdelho. These varieties make an excellent blend, but as the Palomino ripens later than the Verdelho, the blending should be done at the first racking. Whether dry wines of the true Jerez type can be produced in California cannot be definitely settled without considerable further experiment.

PEDRO JIMENES.

(See Vit. Rept. 1883–85, p. 130; 1885–86, p. 105.)

Synonyms: Pero Ximenes; Pedro Ximenez.

The Pedro Jimenes is the principal wine-grape of Malaga, Granada, and Motril; it is also cultivated to a more limited extent in Jerez and Pajarete. It is chiefly famous as the grape from which the widely known Pero Jimenes wine is made. It is also used in conjunction with the Palomino in the manufacture of dry Sherries, and occasionally with the Tintas for the manufacture of red wines. It has been introduced with great success into the Crimea and Algeria, and less successfully into the south of France. Clemente describes and figures two varieties

under this name, one of which he calls the typical Pedro Ximenez, and the other the Ximenez Zumbon. They differ considerably in size of berries and fertility of the vines, but are, according to Mas and Pulliat, simple variations obtained by selection of cuttings.

Description.—Vine vigorous and productive, with slender, short-jointed canes; leaves of medium size, with shallow, narrow sinuses, teeth blunt and short, upper surface glabrous, the lower surface at first covered with a little close wool, becoming glabrous, veins light yellow; bunches very large, branching, loose, but well filled, berries very large, slightly oval, firm, fleshy, and of golden-yellow color.

The above description is taken from vines as they are growing at the Experiment Stations, and differs in several respects from the description of this variety in European works. The grapes as they grow here are much larger, ripen later, and do not attain the extremely high sugar contents with which the Pedro Jimenes is credited in Andalusia. It is somewhat doubtful, therefore, if we have the real Pedro Jimenes here, but a new importation made by the Agricultural Experiment Station this year will probably settle the question. The average must composition of this variety has been: at Mission San José and Cupertino, 21.8% of sugar and 0.42% of acid; at Fresno and Tulare, 22.7% of sugar and 0.38% of acid; at Paso Robles, 21.5% of sugar and 0.45% of acid. The figures for Amador are not given, as the grapes were gathered there before they were mature. These figures show that this variety fails to attain as large an amount of sugar as the Palomino, and shows a little more acid. It ripens late, and is certainly not to be recommended for the cooler localities. In the hotter valleys it has so far not equaled the Palomino either in chemical composition or in quality, and for the making of Sherries cannot at present be said to have shown any advantages over that variety. It makes a neutral, dry wine, of very light body, which may be useful in blending and for the manufacture of champagne wines.

It may find a place as a table-grape, as its magnificent bunches and berries are not exceeded in beauty by any white variety, and their firmness makes it more suitable for shipping purposes than the Verdal. The vine requires a rich soil and short-pruning to maintain its fertility. As a variety for dry white wine the Pedro Jimenes has shown some good qualities at Tulare. It requires, however, the addition of some variety of higher aroma, such as the Malmsey (see No. 1900), and would also be improved by the addition of a more acid grape for this purpose.

It will be seen by the above account that the character of this grape, and of the wine made from it, is so different from what it is credited with in Spain that the discrepancy can hardly be accounted for by simple difference of conditions.

TABLE OF PRODUCTION.

PEDRO JIMENES.	Number of Vines.	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking.
1887—No. 784 (long-pruned). J. T. Doyle, Cupertino	20	146	7.3	Oct. 27
1888—No. 953 (long-pruned). J. T. Doyle, Cupertino	19	140	7.3	Nov. 6
1889—No. 1191. J. T. Doyle, Cupertino	16	120	7.5	Oct. 17

PEDRO JIMENES.	Date of Picking	MUST.				WINE.						
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight.	Alcohol. By Volume.	Total Acid as Tartaric, at Six to Eight Months.	Volatile Acid	Body	Ash	Sugar
1884—No. 266. Natoma Wine Co., Natoma		20.78	20.61	.33	.40	9.63	12.00	.56	.....	1.18	.39	.....
1886—No. 484. Natoma Wine Co., Natoma	Sept. 20	19.30	18.89	.38	.35	7.78	9.73	.59	.....	2.00	.....	.....
1887—No. 784. J. T. Doyle, Cupertino	Oct. 27	21.26	20.61	.45	.40	7.50	9.36	.68	.23	2.30	.....	.....
1888—No. 953. J. T. Doyle, Cupertino	Nov. 6	19.40	19.89	.35	.48	7.64	9.54	.36	.....	2.40	.....	.....
1889—No. 1191. J. T. Doyle, Cupertino	Oct. 17	20.06	.....	.25	.41	14.33*	17.70*	.21	.....	4.00	.....	.....
1890—No. 1244. Margherita Vineyard, Fresno	Aug. 23	21.20	20.39	.41	.61	16.31*	20.06*	.30	.....	2.77	....	5.15
No. 1352. J. Gallegos, Mission San José	Oct. 12	22.30	.....	.42	.....	14.08*	17.40*	.34	.....	2.48	.....	2.60
No. 1404. J. T. Doyle, Cupertino	Oct. 20	19.70	.....	.47	.23	13.92*	17.20*	.33	.....	2.08	.....	traces
1891—No. 1502. Fresno	Sept. 22	23.70	23.13	.45	.....	15.50*	19.08*	.30	.....	2.61	.....	1.74
No. 1502*a*. Fresno	Sept. 22	23.70	23.13	.45	.....	16.31*	20.06*	.27	.....	.....	.....	.....
No. 1606. Mission San José	Oct. 25	24.80	.....	.49	.37	17.25*	21.19*	.20	.....	3.31	.....	.64
1892—No. 1670. Tulare	Sept. 17	22.60	21.38	.33	.47	14.82*	18.25*	.38	.....	2.55	.....	1.75
No. 1779. Mission San José	Oct. 13	23.15	22.67	.50	.....	9.27	11.55	.53	.....	2.60	.....	.....
1893—No. 1853. Amador station	Sept. 13	19.30	.....	.53	.....	.....	.....	.....	.....	.....	.....	.....
No. 1900. Tulare	Sept. 27	22.20	21.80	.41	.43	8.48†	10.58†	.45	.....	2.60	.....	.....
No. 1916. Paso Robles	Oct. 5	21.50	21.00	.40	.38	.....	18.25*	.35	.....	2.85	.....	.....
No. 2036. Cupertino	Oct. 30	23.70	.....	.47	.....	.....	.....	.....	.....	.....	.....	.....
1894—No. 2164. Amador station	Sept. 17	21.50	.....	.58	.....	.....	.....	.....	.....	.....	.....	.....
No. 2214. Paso Robles	Sept. 26	21.50	.....	.49	.....	.....	.....	.....	.....	.....	.....	.....
No. 2246. Mission San José	Oct. 3	22.30	.....	.42	.....	.....	.....	.....	.....	.....	.....	.....
No. 2350. Tulare	Oct. 27	23.90	.....	.29	.....	.....	.....	.....	.....	.....	.....	.....

*Fortified. †Blend with No. 1901 (Malmsey).

RECORD OF TREATMENT.

No. 784. *Pedro Jimenes*, from Cupertino. Received October 28, 1887, in good condition, and crushed on the same day. A few bunches were compact, but they were generally loose and characteristically branched; the berries were large, sound, sweet, and with very little acid, a few were prematurely dried, and there was some coulure. The must showed 21.26% of solid contents by spindle and 0.45% of acid. The temperature of the grapes at crushing was 72°, and the maximum reached was 88°, on the second day. The yield of wine was 8.7 gals., being at the rate of 170 gals. per ton.

At two weeks, when the wine was racked, the odor was not good. A month later it was still cloudy, and had a flat and suspicious taste. An examination of the lees showed the presence of acetic ferment and some filaments. The wine was therefore racked and pasteurized. After this the wine did not improve, but continued to deteriorate until, at fourteen months, it was distilled.

No. 953. *Pedro Jimenes*, from Cupertino. Received November 8, 1888, in good condition. The bunches showed signs of coulure, and the berries were deficient in both acid and sugar. The 98.5 lbs. crushed yielded 7.8 gals. of wine, or at the rate of 160 gals. per ton. The temperature of the grapes at crushing was 67°, and the maximum reached was 84°, on the second day. The wine was dry on the eleventh day.

At two weeks the wine was drawn off, and two weeks later it was taken to the cellar. At two months it was clear and with fair aroma, but too low in alcohol and with a green taste. Two months later it was racked again and the lees examined. At nine months the wine was bright and had improved in bouquet and flavor; it tasted quite sound, and had developed rapidly. At thirteen months it was in good order, but some bottled at four months had not kept well. At fifteen months the lees were sound, and the wine was bright, and had developed a strong Sherry bouquet and flavor. Five months later it was still in good order, but the aroma had diminished and the wine tasted a little thin; the lees were quite sound, and a month later the wine was bottled. At two years and four months the wine bottled at four months was spoiled, but that bottled at twenty-one months was bright, delicately flavored and clean-tasting, but rather thin. At four years it had changed little, and was still bright and sound. At seven years it had deteriorated and tasted mousy.

No. 1191. *Pedro Jimenes*, from Cupertino. Received October 18, 1889, in fairly good condition, and was crushed on the same day. The grapes were extremely fine in appearance, the bunches very large and well filled with very large berries; they were, however, rather low in sugar. The must showed 20.06 of solid contents by spindle and 0.25 of acid. The 56 lbs. crushed yielded at the rate of 161 gals. per ton. The temperature of the grapes at crushing was 69°, and the maximum reached was 75°, on the third day. On the third day the fermentation was checked by the addition of a small quantity of spirits, and on the fifth day the fortifying was completed.

At three months the wine was clear, but was thin and insipid; only in the faint bouquet was there any suggestion of the high quality which the variety ought to show. Three days later it was racked and sweetened by the addition of rock-candy. At four months it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At seven months it was bright, clean-tasting, and much improved. It was racked again, and four months later showed little change. At twenty months it was bright, with pleasing but not marked flavor, of fair quality, but lacking in body and character. Eight months later it showed considerable improvement. At six years and four months it was in good condition, was smooth, agreeable, and mature, but with little aroma or flavor.

No. 1244. *Pedro Jimenes*, from Fresno. Received August 26, 1890, in good condition, but not quite mature. The must showed 21.2 of solid contents by spindle and 0.41 of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 83°, on the third day. On the third day the wine was fortified.

At three months the wine was nearly clear, with less aroma and flavor than the Palomino from Fresno, but still very pleasing. The acidity was low, but there was too much sweetness. Two months later it was bright, with good, delicate aroma, less pronounced than the Palomino, but more delicate. The wine was racked, and put in the heating-chamber, at a temperature of 110°, for three months. At ten months it was in good order, with good Sherry aroma and flavor, but not of marked character. It was racked for the third time, and at seventeen months it was bright, clean-tasting, and agreeable, but too sweet. It was racked again, and at three years and ten months was still in good order. Four months later it was nearly mature, and was a good wine but for an excess of sweetness and a slight bitterness; it was put in glass. At five years and five months it was a good, clean-tasting Sherry, with rather more bouquet than the Palomino, but less marked "rancio" taste.

No. 1352. *Pedro Jimenes*, from Mission San José. Received October 14, 1890, in fair condition. The must showed 22.3 of solid contents by spindle and 0.42 of acid. The temperature of the grapes at crushing was 66°, and the maximum of 82° was reached on the third day. On the fourth day the wine was fortified while still a little sweet.

At three months the wine was bright, with faint aroma and fair flavor, rather too light, and the alcohol not well blended. A week later it was racked and put in the heating-chamber, at a temperature of 110°, for three months. At eight months it was

bright and much improved in bouquet and flavor, clean-tasting, fruity, and well flavored. At this date it was racked. At sixteen months it was in very good condition, with good bouquet and flavor, rather low-bodied, but otherwise a good Sherry. After this the wine did not keep well, on account of the smallness of the keg.

No. 1404. *Pedro Jimenes*, from Cupertino. Received October 23, 1890, in good condition, but not quite mature. The ripening was irregular. The must showed 19.7% of solid contents by spindle and 0.47% of acid. The temperature at crushing was 66°, and the maximum reached was 82°, on the third day. It was fortified on the third day while still sweet.

At three months the wine was bright, but thin and vapid. It was racked, and two months later refortified. At seven months it was put in the heating-chamber, at a temperature of 105°, for three months. After this it did not improve, but remained a poor wine without quality. It was thin, flavorless, and unpleasing.

No. 1502. *Pedro Jimenes*, from Fresno. Received September 25, 1891, in good condition. The must showed 23.7% of solid contents by spindle and 0.45% of acid. The temperature of the must at crushing was 70°, and the maximum reached was 75°, on the third day. The fermentation was slow, and on the seventh day, when the wine was fortified, it was still sweet. Half of the must was used for a special fermentation, as follows: On the second day the must was fortified to 6% of alcohol; on the third day the maximum temperature of 78° was reached; on the fourth day 1% of alcohol was added. The fermentation continued slowly for fifteen days, when the fortifying was completed.

No. 1502 (ordinary fermentation). At four months the wine was full-flavored and rather too sweet. A month later it was racked for the second time, and at six months was put in the heating-chamber, at a temperature of from 90° to 95°. At two years and ten months it differed little from No. 1502*a*, but was, if anything, not quite so good. Four months later, when it was bottled, it was a little too sweet. At four years and five months the wine was clean-tasting, neutral, still immature, but promising.

No. 1502*a* (special fermentation). At four months the wine was bright, full-flavored, and of medium sweetness. A month later it was racked, and at six months was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and ten months it was a very agreeable Sherry, with good bouquet and flavor of distinctive Sherry character, but not quite perfect in after-taste. Four months later it was bottled; it was very good, but had a slight bitterness. At four years and five months it differed little from No. 1502.

No. 1606. *Pedro Jimenes*, from Mission San José. Received October 28, 1891, in poor condition, many grapes being moldy. The temperature of the grapes at crushing was 68°, and the maximum reached was 81°, on the third day. The must showed 24.8% of solid contents by spindle and 0.49% of acid. The wine was fortified on the fourth day.

At three months the wine was clear, with full sweetness, but not much flavor. A month later it was racked, and at five months was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and nine months it was bright, of good, clean taste, agreeable aroma and flavor, but little Sherry character. Four months later it had improved, and was put in glass. At four years and four months it was a fair Sherry, with good flavor, but not mature, and lacking in delicacy of aroma.

No. 1670. *Pedro Jimenes*, from Tulare station. Received September 19, 1892, in good condition, and of good quality. The must showed 22.6% of solid contents by spindle and 0.33% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 77°, on the fourth day. The wine was fortified on the sixth day while still a little sweet.

The wine was clear at three weeks, and was racked. At three months it was bright and well flavored, but too dry. It was racked again, and at six months was refortified and sweetened. At thirteen months it was racked again, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years it was in good order, with full flavor and aroma, good body, sufficient sweetness and alcohol, altogether an agreeable Sherry, and maturing quickly. At three years and five months it was a very good Sherry, of clean taste, full aroma, and nearly mature.

No. 1779. *Pedro Jimenes*, from Mission San José. Received October 16, 1892, in good condition. The must showed 23.15% of solid contents by spindle and 0.50% of acid. The temperature of the grapes at crushing was 62°, and the maximum reached was 80°, on the third day. On the sixth day the wine was nearly dry, and on the seventh day it was racked off the thick lees.

In three weeks the wine was clear and perfectly dry. At one month it was racked and taken to the cellar. At three months it was bright, with some aroma, good flavor, medium acid, and good body; in general, very agreeable. Two months later it was in perfect condition, and was a good, clean-tasting wine. It was racked for the third time, and at eight months it had retained its good quality and was superior to No. 1780, Palomino. Tastings at ten and fourteen months showed gradual development and the acquirement of some bouquet. At fifteen months it was bottled. Two years after bottling it had made no deposit in the bottles, and was a good, neutral, clean-tasting wine, somewhat lacking in bouquet, but fully mature.

No. 1853. *Pedro Jimenes*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The bunches were large and loose; the

berries of good size, not mature. The must showed 19.3% of solid contents by spindle and 0.53% of acid.

No. 1900. *Pedro Jimenes*, from Tulare station. Received September 29, 1893, in good condition, but not quite mature. The bunches and berries were both large, and of very fine appearance. The must showed 22.2% of solid contents by spindle and 0.41% of acid. The grapes were mixed with No. 1901, Malmsey, from Tulare, in the proportion of 50 lbs. of the former to 72 lbs. of the latter. The temperature of the grapes at crushing was 66°, and the maximum reached was 78°, on the third day.

The wine was nearly dry on the fourth day. At one month it was clear, of good aroma and pleasing flavor, and was racked and taken to the cellar. At four months it was in good condition, with marked aroma and good body. A month later it was racked for the second time, and at seven months it was a wine of good character, fresh-tasting and pleasant. At eleven months it had developed well and retained its good qualities. At twelve months it was one of the best of the Tulare wines. At seventeen months it had changed little and was nearly mature. Three months later it was bottled. At two years and five months it was bright and without deposit in the bottles. It was very fresh and clean-tasting, and had developed a good bouquet. The Malmsey had given it a slight Muscat aroma.

No. 1916. *Pedro Jimenes*, from Paso Robles station. Received October 7, 1893, in good condition. The bunches were large, irregular, and loose; the berries over average in size, slightly oval and crisp. The grapes were quite mature. The must showed 21.5% of solid contents by spindle and 0.40% of acid. The temperature of the grapes at crushing was 68°, and the maximum reached was 78°, on the third day. On the seventh day the wine was fortified while still sweet.

At two months the wine was bright, but flat and too dry. At eight months it was racked for the second time, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At eleven months it was racked again. At fourteen months it was in good order and much improved; its flavor and aroma were good, but it was too alcoholic. At two years and four months it was bright, still raw, but full flavored, clean-tasting, and promising.

No. 2036. *Pedro Jimenes*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition. The bunches were very large, conical, winged, loose; the berries varying from very large to very small in the same bunch, crisp, juicy, very sweet, and quite mature. The must showed 23.7% of solid contents by spindle and 0.47% of acid.

PALOMINO.

(See Vit. Rept. 1883–85, p. 131; 1885–86, p. 105.)

Synonyms: Listan; Temprano; Tempranilla; Golden Chasselas (California).

It is from this variety that the bulk of the Manzanillas and dry export Sherries of southwestern Spain are made. It is also used extensively in Malaga, both for wine-making and for the table. In Granada and other parts of southern Spain it is planted chiefly as a table-grape, for which purpose it is much esteemed. It is also used to a more limited extent for the production of the sweeter wines of Cadiz, but generally in connection with Pedro Jimenez or some other variety.

Description.—Vigorous in all fairly productive soils; leaves medium to large, five-lobed, upper sinuses wide at the base and often closed above, upper surface loose, woolly when young, soon becoming glabrous, lower surface densely and permanently white-woolly; bunches medium to large, irregular, loose; berries large, round, or flattened vertically, crisp, and fleshy.

The Palomino has established itself as a valuable grape for some parts of California. It has been used for the production of dry wine in some of the cooler localities, but not with great success. It is a good and regular bearer, but the wine in such localities is lacking in freshness and quality. The chemical composition of the must shows it to retain its European characteristics in California, and that it is essentially a Sherry or sweet-wine grape. It attains a high percentage of sugar even in the coast counties, is very regular in its ripening, and never exhibits excess of acid. The average composition of the must at Mission San

José and at Cupertino has been 22.6% of sugar and 0.41% of acid; at Fresno and Tulare, 23.9% of sugar and 0.29% of acid; at Paso Robles, 21.3% of sugar and 0.39% of acid; at Amador, 23.0% of sugar and 0.43% of acid. It cannot, therefore, be recommended for the production of light or dry wines in any locality, on account of its lack of acid and freshness. Of all the true Sherry grapes, however, it is the one which is most suited to the cooler localities. It ripens earlier and more regularly than the Pedro Jimenes and Mantuo, and makes a good, sweet Sherry, even in the coast counties. It has a distinctive natural aroma, which is lacking in most of the other Sherry grapes, but which decreases with age. As a grape for sweet wine or Sherry, it can be well recommended for any except the very late localities and those where the soil is too poor.

TABLE OF PRODUCTION.

PALOMINO.	Number of Vines	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking
1887—No. 765 (long-pruned). J. T. Doyle, Cupertino	20	106	5.3	Oct. 20
No. 698 (long-pruned). J. T. Doyle, Cupertino	20	378	18.9	Oct. 5
No. 728 (short-pruned). J. T. Doyle, Cupertino	20	232	11.6	Oct. 13
1888—No. 951. J. T. Doyle, Cupertino	18	218	12.1	Nov. 5
No. 952. J. T. Doyle, Cupertino	20	370	18.5	Nov. 5
1889—No. 1198. J. T. Doyle, Cupertino	16	175	10.9	Oct. 24

PALOMINO.	Date of Picking.	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight.	WINE. Alcohol. By Volume.	WINE. Total Acid as Tartaric, at Six Months.	WINE. Volatile Acid at Six Months.	WINE. Body	WINE. Ash	WINE. Sugar
1884—No. 267. Natoma Wine Company, Natoma		23.86	23.81	.32	.40	11.08	13.50	.53		1.85	.25	
1885—No. 384.† L. D. Combe, San José						10.54	13.00	.57		2.18	.25	
1886—No. 547. E. W. Hilgard, Mission San José		23.70		.55								
No. 504. J. T. Doyle, Cupertino	Sept. 27	16.30	15.68	.53	.27	6.35	8.00	.59		1.55		
1887—No. 727 (long-pruned). E. W. Hilgard, Mission San José	Oct. 10	22.00	20.85	.35	.40	8.91	11.09	.47	.02	2.40		
No. 765 (long-pruned). J. T. Doyle, Cupertino	Oct. 20	23.09	22.67	.42	.44	9.78	12.18	.44	.05	2.60		
No. 698 (long-pruned). J. T. Doyle, Cupertino	Oct. 5	19.57	19.75	.37	.38	7.50	9.36	.49	.06	2.10		
No. 728 (short-pruned). J. T. Doyle, Cupertino	Oct. 13	23.30	22.67	.47	.37	9.70	12.09	.47	.05	2.60		
No. 683. R. Wegener, Livermore	Sept. 13	22.60	22.58	.38	.40	9.12	11.36	.47	.05	2.40		
1888—No. 952. J. T. Doyle, Cupertino	Nov. 5	21.57	22.67	.18	.36	8.77	10.91	.52		2.05		
No. 951. J. T. Doyle, Cupertino	Nov. 5	21.39	21.80	.24	.34	8.27	10.36	.42		2.30		
1889—No. 1041. Margherita Vineyard, Fresno	Sept. 2	25.00	25.19	.18	.65	*13.92	17.20	.44		2.35		5.20
No. 1171. J. Gallegos, Mission San José	Oct. 15	23.05	24.13	.38	.33	*15.58	19.00	.32		3.01		
No. 1198. J. T. Doyle, Cupertino	Oct. 24	23.70	23.13	.22	.42	9.05	11.27	.39		1.95		
1890—No. 1239. Margherita Vineyard, Fresno	Aug. 23	23.92	23.42	.34	.33	*14.82	18.25	.25		2.48		9.00
No. 1311. J. T. Doyle, Cupertino	Oct. 7	20.85		.43	.27	9.41	11.73	.38		2.10		
No. 1397. J. T. Doyle, Cupertino	Oct. 18	24.60		.31								
No. 1423. J. Gallegos, Mission San José	Oct. 31	28.00		.34								
1891—No. 1476. Fresno	Aug. 28	24.10	23.62	.36	.48	*16.31	20.00	.11		2.45		1.50
No. 1519. Mission San José	Sept. 30	25.45		.53								
1892—No. 1654. Paso Robles	Sept. 13	21.30	20.21	.39	.31	*15.67	19.28	.38		2.55		1.40
No. 1671. Tulare	Sept. 17	23.70	22.67	.32	.48	*15.42	18.98	.37		2.55		1.25
No. 1780. Mission San José	Oct. 13	20.50	19.75	.55		8.00	10.25	.59		2.55		
1893—No. 1843.‡ Tulare	Sept. 10	21.95	20.24	.38	.52	*14.75	18.88	.32		4.00		1.39
No. 1875.‡ Amador station	Sept. 12	20.60		.47								
No. 1979. Tulare	Oct. 16	23.70	22.23	.26	.39							
No. 2019. Mission San José	Oct. 26	22.90	21.38	.61	.35	*13.81	17.70	.48		4.30		1.83
No. 2067. J. T. Doyle, Cupertino	Oct. 31	24.80		.47								
1894—No. 2154. Tulare	Sept. 15	24.00		.28								
No. 2165. Amador station	Sept. 17	24.05	22.67	.41								
No. 2166. Amador station	Sept. 17	24.40	23.13	.38								
No. 2251. Mission San José	Oct. 3	22.40		.41								
No. 2292. Tulare	Oct. 10	24.60	24.01	.26								

* Fortified. † Wine sent for examination. ‡ "Golden Chasselas."

RECORD OF TREATMENT.

No. 683. *Palomino*, from R. Wegener, Livermore. The grapes arrived September 16, 1887, and were worked the following day. Their condition was good, so far as transportation was concerned, but many of the berries were half-dried and some rotten and fermenting. They were picked over before crushing. The bunches were very characteristic, large, loose, with many pendent branches; there was very little coulure; the berries were, on the average, small, but very unequal, strictly globular, bronzed on the exposed side, thick-skinned, sweet, and low in acid. The must showed 22.6% of solid contents by spindle and 0.38% of acid. The must from 80 lbs. was crushed, and reached a maximum temperature of 81° on the third day. The grapes yielded juice at the rate of 150 gals. per ton.

Ten days after crushing the wine was drawn off from the thick lees, and at three months was bright, with some aroma, sound and agreeable. It was racked for the second time at four months; and at eight months, the lees showing some unsound germs, it was racked again and pasteurized. Six weeks later it was clear and had developed some bouquet; the acid was moderate, but slightly sharp. At sixteen months the wine was distilled for brandy.

No. 698. *Palomino*, from Cupertino. The grapes were received October 6, 1887, and crushed the following day. They were in good condition; the bunches large and compact, the berries generally large, but some small and deeply colored; there was little coulure. The must showed 19.57% of solid contents by spindle and 0.37% of acid. The maximum temperature reached during fermentation was 85°, on the third day. The 113 lbs. of grapes crushed yielded must at the rate of 158 gals. per ton.

In three weeks the wine was drawn off from the thick lees. At two months it was clear, of good aroma, medium and agreeable acid, sound, and well advanced. At seven months the wine was racked and pasteurized for safety. At seven months it was a neutral wine of moderate acid and rather backward development. At fifteen months it was distilled for brandy.

No. 727. *Palomino*, from Mission San José. The grapes were received October 13, 1887, and worked the following day. They were in fair condition, but of very uneven degrees of development, being from vines of various ages. The berries were, on the average, 40% larger than those of No. 683, Palomino, from Livermore. Some of the berries were dried to raisins and some were sunburned. The must showed 22.0% of solid contents by spindle and 0.35% of acid. The fermentation reached its maximum on the third day at a temperature of 86°, and was finished on the thirteenth day. The yield from 98.8 lbs. crushed was at the rate of 120 gals. per ton.

Three weeks after crushing the wine was drawn off from the thick lees. Three weeks later it was still turbid, but showed good quality; the acid, however, was rather suspicious. An examination of the lees showed the presence of improper germs, so the wine was racked off and pasteurized. At eight months it was clear, much improved, a light wine with some bouquet. It was racked again, and at fifteen months was distilled for brandy.

No. 728. *Palomino*, from Cupertino. The grapes were received October 14, 1887, and crushed the same day. The lot was in excellent condition, and mature. The bunches were very large and fine, and showed very little coulure; one bunch weighed nearly 2 lbs. The berries were very large, and of good flavor. The must showed 23.3% of solid contents by spindle and 0.47% of acid. The 102.3 lbs. crushed yielded at the rate of 137 gals. per ton. The temperature of the grapes at crushing was 69.5°, and the maximum reached was 82°, on the third day.

Two weeks after crushing the wine was drawn off from the thick lees. At two months the wine was still cloudy, with good acid and some aroma. The lees showed some unsound ferments, so the wine was racked and pasteurized. At eight months the wine was clear, had developed some bouquet, but was not quite clean-tasting, and had less Sherry taste than No. 765. At this date it was racked again, and at fifteen months it was distilled for brandy.

No. 765. *Palomino*, from Cupertino. Received October 21, 1887, in fair condition. The bunches were large, but much coulured; the berries uneven in size, and on some bunches abortive and dried up before maturity. The must showed 23.09% of solid contents by spindle and 0.42% of acid. The 93 lbs. crushed yielded juice at the rate of 120.9 gals. per ton. The temperature of the grapes at crushing was 74°, and the maximum reached was 83°, on the second day.

At two months the wine was still a little cloudy; it had but little aroma, and had a suspicious taste. A microscopic examination of the lees showed unsound germs, so the wine was racked and pasteurized. At eight months it had improved very much, had developed some bouquet and a full Sherry taste, but was not quite clean-tasting. It was racked again, and at fifteen months distilled for alcohol.

No. 952. *Palomino*, from Cupertino. Received November 7, 1888, in excellent condition, and mature. The bunches were loose and the berries of good size. The must showed 21.57% of solid contents by spindle and 0.18% of acid. The 105 lbs., which were crushed on the day they arrived, yielded 7 gals. of wine, being at the rate of 133 gals. per ton. The temperature of the grapes at crushing was 70°, and the maximum reached was 84°, on the third day. The wine was dry on the twelfth day.

At three weeks the wine was racked and taken to the cellar. At three months it was not quite clear, but was sound and good, and had some flavor and bouquet. At five months the lees were sound, but at six months they showed some unsound germs, so the wine was pasteurized. Two months after pasteurizing it was racked; it was clear and tasted sound. At nine months it was bright, with marked and agreeable flavor, full acid, clean taste, and advanced development. At fourteen months the wine in the keg was in good condition. Some bottled at four months was sound, but tasted flat; some bottled at eight months was very good, but had less bouquet than that in the keg. At fifteen months the wine was mature, and was bottled; it was in good condition, and showed less character and more acid than No. 951, the imported Palomino. At two years and four months the bottled wines were tasted. That bottled at four months was spoiled. There was little difference between that bottled at eight months and that bottled at fifteen—both were bright, of agreeable, neutral flavor, little bouquet, and low body. After this the earlier bottled wines deteriorated. That bottled later improved for about a year, acquiring a "goût de rance," but after that deteriorated, and at seven years had contracted a "mousy" taste.

No. 1041. *Palomino*, from Fresno. Received September 5, 1889, in fair condition. The bunches were of medium size, very ripe, but not dried. They were crushed on the day they arrived, and yielded at the rate of 146 gals. per ton. The temperature of the grapes at crushing was 70°, and the maximum reached was 84°, on the fourth day. On the sixth day the wine had fermented sufficiently, and was fortified.

At four months the wine was clear and of agreeable aroma and flavor, with rather too much acid, but giving promise of good quality. It was racked, and, being too dry, was sweetened by the addition of a small quantity of rock-candy. A month later it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At nine months it was racked for the third time; it was bright, of good amber color, and good quality. At thirteen months it was in good condition, and showed much improvement in bouquet and flavor. At twenty-two months it was clear, full-flavored, and well developed. At six years it was in good order, and mature. It was a very smooth, clean-tasting, sweet Sherry, full-flavored, and with some bouquet.

No. 1171. *Palomino*, from Mission San José. Received October 16, 1889, in good condition, and mature. The grapes were crushed the same day, and yielded at the rate of 144 gals. per ton. The temperature of the grapes at crushing was 63.5°, and the maximum reached was 81°, on the third day. On the second day, when the temperature had risen to 77°, 0.25 gal. of spirits at 73% was added to the 3.6 gals. of must On the third day 0.125 gal. was added, and on the seventh day the final addition of spirits was made.

At four months the wine was clear, clean-tasting, and agreeable, but without much character. A week later it was put in the heating-chamber, at a temperature of from 90° to 95°. At eight months it was racked for the second time; it was bright and showed much general improvement. Four months later it was in good condition and was getting on well. At twenty-one months it was bright and good, but slightly bitter. At two years and five months it had developed into a fair Sherry, but was still rather raw. Four years later it was in good condition, smooth and clean-tasting, with good Sherry flavor and more character than No. 1191, Pedro Jimenes, from Cupertino.

No. 1198. *Palomino*, from Cupertino. The grapes were received October 24, 1889, in fair condition, and mature. They were crushed the same day, and yielded at the rate of 160 gals. per ton. The must showed 23.7% of solid contents by spindle and 0.22% of acid. The temperature of the grapes at crushing was 68°, and the maximum reached was 76.5°, on the third day.

The wine was racked at two weeks, and at six weeks was bright, of agreeable flavor and aroma; it was racked and taken to the cellar, but after this it deteriorated, and at three months the odor was not good, the lees showed secondary ferments, and the wine had to be pasteurized. At ten months it had improved, was smooth and agreeable, but not quite clear, and was of inferior aroma. After this it deteriorated, and at sixteen months, though it was bright, it had suffered from the smallness of the keg and had to be put in glass. It changed little in glass for some time, but was evidently of such poor keeping quality that it was thrown away.

No. 1239. *Palomino* (Golden Chasselas), from Margherita Vineyard, Fresno. Received August 26, 1889, in good condition, and mature. The must showed 23.9% of solid contents by spindle. The fermentation continued for three days, at the end of which time the murk was fortified while still sweet. The maximum temperature reached was 82°.

At three months after crushing the wine was bright, possessed of a good aroma, full flavor, low acid, and too much sugar. At five months it was still in good order, but was too low in alcohol, and was therefore refortified. At seven months it was racked for the second time, and placed in the heating-chamber, at a temperature of 105°, where it was kept for three months At seventeen months the wine was in first-class condition, had a good flavor, but had lost some of its aroma.

No. 1311. *Palomino* (Golden Chasselas), from J. T. Doyle, Cupertino. Received October 10, 1890, in fair condition; very fine grapes, but most of the bunches had a few rotten berries. The must showed 20.85% of solid contents by spindle. The fermentation was cool and somewhat prolonged, lasting over eight days.

At one month the wine was nearly clear, possessed of a marked aroma, agreeable flavor, and full, pleasing acid. At two months it was racked for the second time, and a month later, the lees showing some lactic germs and the taste beginning to be affected, it was

pasteurized. At seven months it was clear and had improved, but still had a faint suspicion of lactic taint in the odor. At fourteen months the lactic ferment had quite disappeared, and the wine had some bouquet and full flavor; it was mature, or nearly so. Two months later the wine was in good condition, having been racked four times, and was bottled. At two years the bottled wine was clear, somewhat deficient in bouquet and freshness, but of good flavor and body.

No. 1397. *Palomino*, from J. T. Doyle, Cupertino. A sample for must analysis arrived October 21, 1890, in fair condition, and mature. The must showed 24.6% of solid contents by spindle.

No. 1423. *Palomino*, from Mission San José. A sample for must analysis arrived October 31, 1890, in fair condition; perfectly mature, and a few of the grapes dried up. The must showed 28.0% of solid contents by spindle.

No. 1476. *Palomino*, from Margherita Vineyard, Fresno. Received August 31, 1891, in good condition. The must showed 24.1% of solid contents by spindle and 0.36% of acid. The grapes were crushed the day of arrival, and the must divided into two lots, which were fermented separately.

No. 1476. The temperature of the must at crushing was 65°, and the maximum reached was 75°, on the third day. On the sixth day the wine was fortified. At four months it was bright, full-flavored, clean-tasting, and with very little sweetness. At five months it was racked for the second time, and a month later put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and ten months it was in good condition, with full flavor and aroma, but slightly bitter. Four months later it showed the effect of being in so small a keg; the sweetness had increased very much by condensation, so the wine was put in glass. At four years and five months it was a full-flavored, agreeable Sherry, but tasted of the keg.

No. 1476*a*. The temperature of the grapes at crushing was 65°. The must was fortified to 5% of alcohol before the fermentation commenced. The maximum temperature reached was 73.5°, on the fourth day. On the eleventh day the wine was still fermenting a little, and as sufficient sugar had been eliminated, the spirits necessary to complete fortifying were added. At four months the wine was bright, full-flavored, and clean-tasting, with moderate sweetness; differed little from No. 1476. A month later it was racked, and at six months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At fourteen months it was in good order, full-flavored, a rather good Sherry, with the peculiar Palomino flavor. The sweetness had increased considerably by evaporation. At this age it was put in glass and loosely stoppered. At four years and five months it differed little from No. 1476, and was still somewhat raw and immature.

No. 1519. *Palomino*, from Mission San José. A sample for must analysis was received October 1, 1891, in good condition, but not mature. The must showed 25.45% of solid contents by spindle and 0.53% of acid.

No. 1654. *Palomino*, from Paso Robles station. Received September 16, 1892, in good condition. The grapes and bunches were very small for the variety. The must showed 21.3% of solid contents by spindle and 0.39% of acid. The temperature of the grapes at crushing was 68°, and the maximum reached was 75°, on the third day. On the fourth day the wine was fortified.

At three weeks the wine was clear, and was racked. At three months it was bright, clean-tasting, nearly dry, and with low acid. At six months it was refortified, sweetened by the addition of a little rock-candy, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At ten months it was bright; it had the distinctive Palomino flavor, but had not yet developed much "rancio." Seventeen months later it had improved, but was lacking in delicacy. At three years and five months it was in good condition; the "rancio" taste was well developed, and the wine was a full-flavored Sherry of good quality.

No. 1671. *Palomino*, from Tulare station. Received September 19, 1892, in very good condition, and mature. The must showed 23.7% of solid contents by spindle and 0.32% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 82°, on the third day. The wine was fortified on the sixth day.

In three weeks the wine was clear, and was racked. At three months it was bright and of good flavor, but too dry. At six months it was sweetened by the addition of a little rock-candy, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At ten months it was bright, but still very raw. At two years it was in good order, with full aroma and strong, characteristic flavor. Diluted with one third Beba to soften it and dilute its somewhat too prominent flavor, it made a good Sherry. At three years and five months it was in good order, more highly flavored than No. 1670, Pedro Jimenes, but less delicate and less mature.

No. 1780. *Palomino*, from Mission San José. Received October 15, 1892, in fair condition, but not mature. The must showed 20.5% of solid contents by spindle and 0.55% of acid. The temperature of the grapes at crushing was 58°, and the maximum reached was 81°, on the third day. On the seventh day the wine was dry and was drawn off from the thick lees.

In three weeks the wine was clear, and at one month it was racked for the second time. At three months it was bright, of rather good aroma and flavor, medium acid and body. Two months later it was in first-class condition and very agreeable. At five months it was racked for the third time, and remained perfectly bright until it was bottled. Tastings at eight, ten, and fourteen months showed gradual improvement and

quick maturing; the wine tasted rather green, but had full, characteristic flavor, and kept well. At fifteen months it was mature, and was bottled. Two years after bottling the wine was bright and had made no deposit in the bottles; it was neutral, lacking in bouquet, but smooth and agreeable.

No. 1843. *Palomino*, from Tulare station. Received September 12, 1893, in good condition. The bunches were rather small and straggling. The must showed 21.95% of solid contents by spindle and 0.38% of acid. The temperature of the grapes at crushing was 65°, and the maximum reached was 81°, on the second day. The wine was fortified on the second day, when it had about 4% of solid contents.

At three months the wine was bright and of moderate sweetness. It was racked for the second time, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At ten months it was racked again. At two years and five months it was bright, full flavored, but still raw and undeveloped.

No. 1875. *Palomino*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The bunches varied very much in size; the berries were large, well-flavored, and nearly mature. The must showed 20.6% of solid contents by spindle and 0.47% of acid.

No. 1979. *Palomino*, from Tulare station. Received October 18, 1893, in good condition. The bunches were of medium size, loose and irregular; the berries large, round, or flattened vertically, sweet, and with very little acid. The must showed 23.7% of solid contents by spindle and 0.39% of acid. The temperature of the must at crushing was 61°, and the maximum reached was 78°, on the third day. The wine was fortified on the fifth day. At two months the wine was bright and had about the right amount of sweetness; it was racked for the second time, and at five months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At nine months it was racked for the third time. At fourteen months it was in good order, smooth, and agreeable, with low acid and good flavor; in general, very promising.

No. 2019. *Palomino*, from Mission San José. Received October 26, 1893, in good condition. The bunches were large, conical, loose, but well filled; the berries of medium size, round, firm, and crisp, but not hard like the same variety from Tulare; the grapes were ripe and of agreeable flavor. The must showed 22.9% of solid contents by spindle and 0.61% of acid. The temperature of the grapes at crushing was 62°, and the maximum reached was 78°, on the third day. The wine was fortified on the sixth day.

At six weeks the wine was bright and a little too sweet. It was racked for the second time, and at two months was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At ten months it was racked for the third time, and at fourteen months it was bright and in good order, smooth and agreeable, with rather too much acid and not so much flavor as the Tulare sample. At two years and four months it showed some improvement; it was a good, clean-tasting wine, and had developed some Sherry character.

No. 2067. *Palomino*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition, and mature. The bunches were large, irregularly short, conical, and well filled; the berries over medium in size and well flavored. The must showed 24.8% of solid contents by spindle and 0.47% of acid.

BEBA.

(See Vit. Rept. 1883-85, p. 135.)

This variety is cultivated over a wide area in southwestern Spain, but nowhere in large quantities. It is used to some extent mixed with other grapes in the production of wines, but is esteemed principally as a table-grape and for keeping through the winter. In parts of the province of Cadiz it is used for the production of raisins. The grapes are dipped in lye before being dried.

Description.—The vine is of medium size, and buds early; the leaves are over average in size, five-lobed, with shallow sinuses, the lower often wanting, upper surface glabrous, the lower with a little close wool; bunches large, irregular, often branching, well-filled; berries medium to large, round, hard, and fleshy, without distinct flavor.

The Beba resembles very much the Palomino in the character of its grapes, which ripen about the same time and have the same tendency to be low in acid. It has shown, on the average, more sugar than the Palomino, but this may be accounted for by the fact that it has generally borne less. As to the quality of the wine, it is of very much the same character as that of the Palomino, but is rather more neutral and quite unfitted for the manufacture of dry wines.

ANALYSES OF MUSTS AND WINES.

BEBA.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Body	Ash	Sugar
1884—No. 271. Natoma	Oct. 7	22.60	.....	.25	.....	11.62	14.27	.50	2.10	.37	.....
1892—No. 1676. Tulare	Sept. 19	23.70	.....	.26	.....	*15.58	*19.18	.38	2.92	.....	1.18
1893—No. 1816. Tulare	Sept. 2	21.05	20.61	.38	.67	.....	*17.20	.41	2.90	.....	.....
No. 1854. Amador station	Sept. 12	22.60	.....	.49	.....	.....	.....	.....	.....	.....	.....
No. 1965. Paso Robles	Oct. 16	27.21	.....	.29	.....	.....	.....	.....	.....	.....	.....
1894—No. 2163. Amador station	Sept. 17	25.20	.....	.38	.....	.....	.....	.....	.....	.....	.....
No. 2169. Tulare	Sept. 18	24.80	24.12	.26	.....	.....	.....	.....	.....	.....	.....

*Fortified.

RECORD OF TREATMENT.

No. 1676. *Beba*, from Tulare station. Received September 21, 1892, in good condition. The must showed 23.7% of solid contents by spindle and 0.26% of acid. The temperature of the grapes at crushing was 69°, and the maximum reached was 82°, on the second day. On the fourth day the wine was fortified.

In two weeks the wine was clear, and was racked. At three months it was bright, of good flavor, but a little too dry. At six months it was racked for the third time, and was sweetened by the addition of a little rock-candy. At thirteen months it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and three months it was in good order, with full, rich flavor and good body and aroma—a very good Sherry, equal to the Pedro Jimenes, but with rather less aroma; a little too sweet. Fourteen months later it had changed very little; it was a good Sherry, but not quite mature and a little bitter.

No. 1816. *Beba*, from Tulare station. Received September 4, 1893, in good condition. The bunches were large, irregular, fairly compact, but not compressed; the berries were round, over medium in size, with little flavor, but mature. The must showed 21.05% of solid contents by spindle and 0.38% of acid. The temperature of the grapes at crushing was 67°, and the maximum reached was 83°, on the third day. On the fourth day the wine was fortified while still sweet.

At three months the wine was bright and not quite sweet enough. It was racked for the second time, and at six months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At ten months it was racked for the third time. At sixteen months it was bright, of good aroma, smooth and agreeable, but still raw. At two years and four months it was bright, with good, marked aroma and full flavor, but little "rancio," still undeveloped, but promising.

No. 1854. *Beba*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition, and mature. The bunches were rather small and straggling; the berries of all sizes. The must showed 22.6% of solid contents by spindle and 0.49% of acid.

No. 1965. *Beba*, from Paso Robles station. A sample for must analysis was received October 14, 1893, in good condition, but not quite mature. The bunches were of medium size, very branching, and irregular; the berries round, small, and hard. The must showed 27.2% of solid contents by spindle and 0.29% of acid.

PERRUNO.

There are several varieties of Perruno in southwestern Spain, one of which, the Perruno Comun, is planted in large quantities, and is considered the best wine-grape of the region, next to the Pedro Jimenes and the Palomino. The variety which is growing at the Experiment Stations seems, however, to be the Perruno duro, a variety which is much less extensively planted, but which is also held in high esteem for wine, and is, besides, much appreciated as a table-grape on account of the lateness of its period of ripening and the resistance of its grapes to the weather and decay.

Description.—Leaves of medium size, five-lobed, the upper lobes overlapping, glabrous above, with a little wool below, teeth very obtuse; bunches large and well filled; berries very large, round, hard, and with little flavor.

The Perruno has shown itself a vigorous grower and good bearer in the sandy, alkali soil of the Tulare station. Its must composition shows it to be preëminently a grape for sweet wines, but, like the Mantuo, its character is too neutral and requires the addition of some grape of higher quality. Though said to ripen very late in Spain, its period of ripening in California is considerably earlier than that of the Mantuo; it has also generally attained a higher sugar content than the latter, so that, on the whole, it is to be preferred to that variety.

ANALYSES OF MUSTS AND WINES.

PERRUNO.	Date of Picking.	MUST.				WINE.				
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol.		Total Acid as Tartaric at Six to Eight Months.	Body.	Sugar.
						By Weight.	By Volume.			
1884—No. 268. Natoma.	Oct. 8	22.76	.....	.31	.31	9.92	12.35	.52	1.95	.....
1892—No. 1687. Tulare.	Sept. 27	22.60	22.23	.29	.40	*16.23	*19.96	.28	2.48	1.62
1893—No. 1874. Amador station.	Sept. 12	18.40	.....	.51	.....	.....	.....	.....	.....	.....
No. 1905. Tulare.	Oct. 1	22.20	20.61	.41	.34	.....	*19.00	.48	2.88	.72
No. 1958. Paso Robles.	Oct. 13	26.30	.....	.15	.....	.....	.....	.....	.....	.....
1894—No. 2184. Amador station.	Sept. 22	24.10	.....	.39	.....	.....	.....	.....	.....	.....
No. 2289. Tulare.	Oct. 6	22.85	22.04	.35	.....	.....	.....	.....	.....	.....

*Fortified.

RECORD OF TREATMENT.

No. 1687. *Perruno*, from Tulare station. Received September 29, 1892, in good condition. The must showed 22.6% of solid contents by spindle and 0.29% of acid. The temperature of the grapes at crushing was 72°, and the maximum reached was 80°, on the second day. On the fourth day the wine was fortified.

At three months, when it was racked for the first time, it was bright, but still very raw. At six months it was racked again, sweetened, and refortified. At twelve months it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years it was in good order, with sufficient sugar and alcohol and full body; a fairly good Sherry, but coarse and not equal to Pedro Jimenes. It was much improved by the addition of one half No. 1705*a* (Napoleon). Fourteen months later it had much improved, was well aged, possessed of a good aroma and flavor, but was a little bitter.

No. 1874. *Perruno*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The bunches and berries were very large, but not quite mature and with little flavor. The must showed 18.4% of solid contents by spindle and 0.51% of acid.

No. 1905. *Perruno*, from Tulare station. Received October 2, 1893, in good condition. The bunches were very large and well filled; the berries very large, round, and hard, not quite mature, and very insipid. The must showed 22.2% of solid contents by spindle and 0.41% of acid. The temperature of the must at crushing was 70°, and the maximum reached was 82°, on the third day. On the fifth day the wine was fortified.

At two months the wine was clear and had very little sweetness. At this date it was racked, and again at six months, when it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At nine months it was racked again, and at fourteen months it was in good condition—a smooth wine of good character, but very undeveloped and tasting of the cask. At two years and four months it had improved and was a good Sherry but for the taste and smell of the cask, which still persisted.

No. 1958. *Perruno*, from Paso Robles station. A sample for must analysis was received October 15, 1893, in good condition. The bunches were large, irregular, and loose; the berries of medium size, round, very hard, and fleshy. The must showed 26.3% of solid contents by spindle and 0.15% of acid.

MANTUO DE PILAS.

(See Vit. Rept. 1883–85, p. 133; 1885–86, p. 106.)

Synonyms: Monte Olivette; Uva de Rey; Gabriela.

This variety is much esteemed for wine-making in southwestern Spain, where it is planted in considerable quantities for blending with the Palomino, to which it is believed to add aroma. In some localities it is cultivated as a raisin-grape, and in others it is much esteemed as

a table-grape. It is very useful for winter keeping, and in some vineyards is left on the vines till after the first autumn rains, to be shipped as a late eating-grape to the Madrid markets.

Description.—Vine productive; canes whitish and very hard; leaves large, with five distinct lobes, more or less overlapping when young, the sinuses much shallower when old, upper surface glabrous even when young, the lower white with close wool, teeth large; bunches large, pyramidal, winged, loose; berries very large, nearly round, crisp, fleshy, hard, and of neutral flavor.

This variety, next to the Pedro Jimenes, is the finest looking and largest of all white Spanish grapes growing at the Experiment Stations. It is rather later than the others, and requires a hotter climate, but at Tulare its fine bunches of large berries should make it very useful as a late table-grape. Its grapes show the same tendency to low acid as the other Sherry grapes in even a more marked degree. It makes a good sweet Sherry, but not quite equal in quality to either the Palomino or the Beba; it is quite neutral in character, and requires blending with a grape of more marked flavor.

ANALYSES OF MUSTS AND WINES.

MANTUO DE PILAS.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Body	Ash	Sugar
1884—No. 269. Natoma	Oct. 8	18.63	-----	.35	-----	7.85	9.82	.53	1.32	.27	-----
1885—No. 477. Natoma	Sept. 19	20.40	20.02	.37	.42	7.78	9.73	.45	-----	-----	-----
No. 497. Natoma	Sept. 24	20.40	-----	.28	-----	8.48	10.58	.35	-----	-----	-----
1892—No. 1688. Tulare	Sept. 27	23.50	23.42	.37	.58	*14.64	*18.03	.31	2.53	-----	1.77
1893—No. 1877. Amador station	Sept. 12	19.30	-----	.50	-----	-----	-----	-----	-----	-----	-----
No. 1957. Paso Robles	Oct. 14	22.75	-----	.30	-----	-----	-----	-----	-----	-----	-----
No. 1966. Tulare	Oct. 12	21.50	20.17	.38	.48	-----	*17.50	.35	3.30	-----	-----
1894—No. 2182. Amador station	Sept. 22	22.10	-----	.40	-----	-----	-----	-----	-----	-----	-----
No. 2332. Tulare	Oct. 13	23.30	22.23	.32	-----	-----	-----	-----	-----	-----	-----

*Fortified.

RECORD OF TREATMENT.

No. 1688. *Mantuo de Pilas*, from Tulare station. Received September 29, 1892, in good condition. The must showed 23.5% of solid contents by spindle and 0.37% of acid. The temperature of the grapes at crushing was 71°, and the maximum reached was 79°, on the second day. The wine was fortified on the fourth day.

In six weeks the wine was clear, and was racked. At two months it was bright, of good flavor, but too dry. At three months it was racked for the second time, and at six months it was sweetened with rock-candy, and refortified. At one year it was put in the heating-chamber, at a temperature of from 90° to 95°. At two years and two months it was in good order—a good, light Sherry, more delicate than No. 1687 (Perruno), but with less character than the Pedro Jimenes. Fourteen months later it had improved, but was still raw.

No. 1877. *Mantuo de Pilas*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. Both bunches and berries were very large, and closely resembled Mourisco branco. The must showed 19.3% of solid contents by spindle and 0.50% of acid.

No. 1957. *Mantuo de Pilas*, from Paso Robles station. A sample for must analysis was received October 15, 1893, in fair condition. The bunches were large, pyramidal, winged, loose; the berries of medium size, round, crisp but not hard, not very sweet, and with little flavor. The must showed 22.75% of solid contents by spindle and 0.30% of acid.

No. 1966. *Mantuo de Pilas*, from Tulare station. Received October 14, 1893, in very good condition. The bunches were large, irregular, loose; the berries very large, slightly oval, crisp, and with very little acid. The must showed 21.5% of solid contents by spindle and 0.38% of acid. The temperature of the grapes at crushing was 62°, and the maximum reached was 78°, on the second day. On the fifth day the wine was fortified.

At two months the wine was bright, but too dry. It was racked first at two months and then at five months, when it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At nine months it was racked again, and at fourteen months it was in good order, neutral, with little aroma or flavor, and still very raw.

MOURISCO BRANCO.

(See Vit. Rept. 1883–85, p. 134; 1885–86, p. 107.)

The Mourisco branco is a large, white grape of the Douro region of Portugal. It is very common and, unlike its black congener, the Mourisco preto, is used principally for the table. For this purpose it is very much esteemed.

Description.—Canes chestnut-colored; leaves rather large, round in outline, with shallow sinuses, upper lobes overlapping, upper surface quite glabrous, lower with a little close, white wool, which disappears with age; bunches large, irregular, winged, loose; berries large to very large, round, flattened at the ends, crisp, on slender pedicels.

This variety has a close family resemblance to the large, white Sherry grapes of southwestern Spain, but is not identical with any of the varieties which are planted at the Experiment Stations, so far as is yet made out. In must composition, general appearance of grapes, and time of ripening, it has a strong resemblance to the Mantuo de Pilas, but the berries are less hard and there is a considerable difference in the leaves. It has not yet been tested sufficiently for an opinion to be ventured as to its suitability to California, but the indications are that it will be useful as a sweet-wine grape in localities similar to those which are suitable to the grapes of Jerez.

ANALYSES OF MUSTS AND WINES.

MOURISCO BRANCO.	Date of Picking.	MUST.				WINE.				
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol. By Weight.	Alcohol. By Volume.	Total Acid as Tartaric, at Six to Eight Months.	Body.	Ash.
1884—No. 270. Natoma	Oct. 7	22.60	.....	.25	...	*11.62	*14.27	.50	2.10	.37
1885—No. 482. Natoma	Sept. 20	25.10	24.97	.31	.40	10.07	12.54	.33	...	...
1892—No. 1716. Tulare	Oct. 3	23.40	.....	.33	...	.....	.....	.....	...	...
1893—No. 1876. Amador station	Sept. 14	18.20	.....	.60	...	.....	.....	.....	...	...
No. 1970. Tulare	Oct. 14	23.50	21.80	.32	.34	*14.97	*19.08	.30	3.10	...
1894—No. 2183. Amador station	Sept. 22	20.00	.....	.49	...	.....	.....	.....	...	...
No. 2312. Tulare	Oct. 11	22.60	.....	.30	...	.....	.....	.....	...	...

* Fortified.

RECORD OF TREATMENT.

No. 1716. *Mourisco branco*, from Tulare station. A sample for must analysis was received October 5, 1892, in good condition. The must showed 23.4% of solid contents by spindle and 0.33% of acid.

No. 1876. *Mourisco branco*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The bunches and berries were very large, without much flavor, and immature. The must showed 18.2% of solid contents by spindle and 0.60% of acid.

No. 1970. *Mourisco branco*, from Tulare station. Received October 16, 1893, in good condition. The bunches were large, irregular, winged, loose; the berries very large, round, flattened at the ends, crisp, on slender pedicels. The must showed 23.5% of solid contents by spindle and 0.32% of acid. The temperature of the grapes at crushing was 63°, and the maximum reached was 74°, on the third day. On the fifth day the wine was fortified.

At two months the wine was bright, of good bouquet and flavor and slight sweetness. It was racked, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At ten months it was racked again. At three years and four months it was in good condition, showed marked aroma and flavor, clean taste, moderate sweetness, little "rancio," still raw and undeveloped.

VERDELHO.

(See Vit. Rept. 1883–85, p. 135; 1885–86, p. 106.)

Synonym: Verdelho di Madeira.

This grape is cultivated extensively in the Island of Madeira, where it enters into the finest grades of wines, especially of dry wines. It is almost or quite equal in quality to the Sercial, the principal dry-wine grape of Madeira, and superior in productiveness and robustness. It is cultivated to some extent in France, but more for the table than for wine. It has been introduced successfully into the Crimea, and was among the first varieties to give satisfactory results in Australia.

Description.—The vine is vigorous, and productive in bunches, which are, however, of very light weight; it bears well with short-pruning; the canes are slender, short-jointed, with a light reddish tint; leaves small to medium, wider than long, the petiolar sinus open, the others small or absent, glabrous on both surfaces except for a little down on the main nerves, teeth distinctly mucronate; the bunches are small, winged or branched, and loose; the berries small, regular, ellipsoidal, on long,

slender pedicels, of a transparent green color, becoming yellowish at maturity; flesh firm, sweet, and agreeably flavored.

The Verdelho ripens early, even in the coast counties, a week or two after the Chasselas; it is somewhat subject to coulure and mildew, but resists the weather well. The grapes are not injured by rain, on account of the looseness of the bunches, and they shrivel up gradually with overripeness. They attain regularly a high degree of sugar, and maintain a much larger percentage of acid than the Spanish Sherry grapes. The average composition of the must has been: at Cupertino and Mission San José, 26.9% of solid contents by spindle and 0.54% of acid; at Fresno and Tulare, 26.4% and 0.55%; at Paso Robles, 25.1% and 0.60%; at Amador station, 26.7% and 0.54%. Such similarity in results from such dissimilar localities shows a wide adaptability for this grape, and also indicates its value for the production of dry Sherries. It acquires a marked and delicate "rancio" flavor very quickly and easily, and its full aroma and high quality make it very valuable as an addition in the making of sweet wines. Its acid is too high to give the best results as a sweet wine when used alone, but the addition of one third to the neutral Sherry grapes with low acid, such as the Perruno, Mantuo, or Pedro Jimenes, is of great advantage to the latter.

TABLE OF PRODUCTION.

VERDELHO.	Number of Vines.	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking.
1887—No. 766. J. T. Doyle, Cupertino	20	28	1.4	Oct. 20
1888—No. 867. J. T. Doyle, Cupertino	19	62	3.2	Sept. 27
1889—No. 1100. J. T. Doyle, Cupertino	19	75	3.9	Sept. 26
1887-96. E. W. Hilgard, Mission San José, average	320	900	2.8	-------

ANALYSES OF MUSTS AND WINES.

VERDELHO.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight.	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months.	Body	Ash	Sugar
1884—No. 272. Natoma Wine Co., Natoma		27.35	25.88	.50	.37	*12.39	15.20	.42	2.82	.33	
1886—No. 568. E. W. Hilgard, Mission San José		25.90		1.00							
1887—No. 766. J. T. Doyle, Cupertino	Oct. 20	30.04	31.48	.49	.45						
1888—No. 838. J. Gallegos, Mission San José	Sept. 9	26.42		.57							
No. 867. J. T. Doyle, Cupertino	Sept. 27	24.15	24.33	.46	.26	9.85	12.27	.64	2.70		
No. 914. E. W. Hilgard, Mission San José	Oct. 16	28.22		.34	.32	*12.39	15.20	.41	2.95		
1889—No. 1100. J. T. Doyle, Cupertino	Sept. 26	26.90	26.99	.54	.40	10.81	13.27	.44	2.86		
1890—No. 1203. Margherita Vineyard, Fresno	Aug. 11	24.10	24.64	.65	.52	*14.75	18.22	.55	2.96		4.60
No. 1297. J. Gallegos, Mission San José	Oct. 1	25.90		.71	.22	*13.77	16.98	.72	3.06		4.50
No. 1322. J. T. Doyle, Cupertino	Oct. 11	27.65		.55							
1891—No. 1451. Tulare	Aug. 26	26.30		.56							
No. 1466. Fresno	Aug. 28	29.10		.54		*16.85	20.71	.45	2.99		1.36
No. 1466a. Fresno	Aug. 28	29.10		.54		*15.92	19.59	.36	3.02		1.58
No. 1485. Paso Robles	Sept. 9	24.10		.55							
No. 1518. Mission San José	Oct. 18	26.05	26.99	.71		*16.08	19.78	.51	3.80		
1892—No. 1689. Tulare	Sept. 26	25.90	27.65	.49		*16.46	20.24	.36	2.95		1.20
1893—No. 1859. Amador station	Sept. 13	26.10		.63							
No. 1904. Tulare	Oct. 1	25.75	25.76	.58	.43		19.90	.53	3.10		
No. 2013. Mission San José	Oct. 29	28.40	27.70	.55	.30						
No. 2102. Cupertino	Nov. 4	27.70		.44							
1894—No. 2180. Amador station	Sept. 22	27.35		.45							
No. 2219. Paso Robles	Sept. 26	26.06		.66							
No. 2220. Tulare	Oct. 1	27.15	26.31	.49							
No. 2249. Mission San José	Oct. 3	24.60		.55							

*Fortified.

RECORD OF TREATMENT.

No. 766. *Verdelho*, from Cupertino. Received October 21, 1887, in good condition. The grapes showed a great deal of early coulure (quite 50%), and the stems were somewhat shriveled. The bunches were large in comparison with the figure in "Les Vignobles," with which otherwise they agreed perfectly. The grapes were very sweet, with little acid, and in proper condition for making into wine. The must showed 30.04% of solid contents by spindle and 0.49% of acid. On October 23d, 25.5 lbs. were crushed. The maximum temperature reached was 82°, on the second day. The wine remained at that temperature for thirty-six hours. The grapes yielded wine at the rate of 142 gals. per ton. The wine was put in glass and unfortunately lost by breakage.

No. 838. *Verdelho*, from Mission San José. A sample for must analysis was received September 12, 1888, in good condition. The must showed 26.42% of solid contents by spindle and 0.57% of acid.

No. 867. *Verdelho*, from Cupertino. The grapes were received September 28, 1888, in good condition, and worked the same day. They showed from 25% to 80% of coulure, and were not quite ripe enough for Verdelho. The must showed 24.15% of solid contents by spindle and 0.46% of acid. The 41 lbs. of grapes crushed yielded 3.4 gals. of wine, or at the rate of 164 gals. per ton. The must started fermenting at a temperature of 63°, and gradually rose to a maximum of 78°, on the fourth day; it continued fermenting for six days more, when it was drawn off at a temperature of 73°.

One month after pressing the wine, being quite quiet, was taken to the cellar. Two months later it had become slightly cloudy; it was, however, of good quality, with low acid, sufficient alcohol and body, and characteristic aroma. Two months later it was pasteurized, as the lees showed some unsound germs. At eight months it was racked for the third time. At ten months it was not quite bright, but of good flavor and bouquet—would be of excellent quality but for suspicion of bad acid. Four months later, when it was racked again, it was bright and considerably improved. At sixteen months it was bright, full-flavored, and mature. The wine had been put in glass at fourteen months, but had deposited no sediment. At one year later it was clear, but had made a slight deposit. It was of good quality, with Sherry-like bouquet, but slightly bitter and lacking in freshness. Eighteen months later it had changed very little. At seven years from the time of making it was a fairly drinkable wine, showing good quality, of Sherry character, but still showed the effect of the slight unsound fermentation which it underwent before it was pasteurized.

No. 914. *Verdelho*, from Mission San José. The grapes were received October 18, 1888, and worked the same day. They were overripe, somewhat shriveled and soft, a few dried up to raisins, and a very few moldy. Considering that the grapes were from two-year-old grafts, and had been long exposed to foggy and changeable weather since ripening, they were in excellent condition. The must showed 28.22% of solid contents by spindle and 0.34% of acid. From 91 lbs. of grapes crushed, 7.2 gals. of wine were obtained, or at the rate of 156.6 gals. per ton. The temperature of the must at starting was 67°, and the maximum reached was 82°, on the fifth day. The wine was drawn off on the seventh day after a good fermentation.

Five weeks later the wine was racked and taken to the cellar. At three months it was still slightly cloudy, but of decided and agreeable Sherry aroma, full alcohol, and pleasing acid. Two months later it was in good condition and the lees were sound. At ten months it was clear, of good quality, a very pleasing dry Sherry. At fourteen months the wine in the keg was very good, but had a slightly bitter after-taste. Some of the wine which had been put in bottle at five months was sound, but undeveloped. At sixteen months the lees showed bitter ferments under the microscope. The wine was not quite bright, but was good except for the slight bitterness. The wine in bottle had not acquired the bitter taste. Five months later the wine had improved and was nearly mature. At twenty-two months it was bottled. At two years and four months the wine bottled at fifteen months was bright, of good flavor and bouquet, and with little deposit. That bottled at twenty-one months was similar, but rather darker in color. At four years both wines were of good quality, but that bottled first was cleaner-tasting and of richer flavor. At seven years the wine was clean-tasting, full-flavored, with a pronounced "rancio" taste, but lacking in bouquet.

No. 1100 *Verdelho*, from Cupertino. Received September 27, 1889, in fair condition, showing somewhat irregular ripening. The must showed 26.9% of solid contents by spindle and 0.54% of acid. From 70.5 lbs. crushed were obtained 5.1 gals. of wine, or at the rate of 143.6 gals. per ton. The must began fermenting at a temperature of 72°, and reached a maximum of 82° on the second day. The wine was dry on the eighth day, when it was drawn off.

At one month the wine was racked and taken to the cellar. It was clear, of full and agreeable aroma and low acid; it was a fruity wine, of high quality. At three months it had progressed well, was clear, solid, and of Sherry character. The lees were examined and found to be sound. Three months later it was in good condition, and was racked again. At this time the lees were sound, and two months later the wine was bright, with full, rich bouquet and flavor, and well advanced toward maturity. At fifteen months it was still bright, but began to show the effect of being in so small a keg, and in order to preserve it, it was pasteurized and put in bottle. A year later it was

bright and had improved somewhat. At three years it showed good quality, but also the effect of being made in so small a quantity.

No. 1203. *Verdelho*, from Fresno. Received August 14, 1890, in excellent condition. The grapes were of unequal ripeness, and some of them tasted green. The bunches were of medium size and well filled; the berries small, both bunches and berries very uniform in size. The must showed 24.1% of solid contents by spindle and 0.65% of acid. The temperature of the must at crushing was 69°, and the maximum reached was 98°, on the third day. The fermentation was conducted in a room kept at an average temperature of 95°. On the seventh day the wine was evidently stuck with over 10% of solid contents. It was racked from the thick lees and left in the hot room. On the ninth day 3 pro mille of ammonium phosphate was added to it. This revived the fermentation a little, but the wine stuck again with 9% of solid contents.

At three weeks the wine had still 9% of solid contents, and showed large quantities of the mannite ferment under the microscope. The wine was racked and fortified. At three months it was clear, but of unpleasing odor. Two months later it was racked again and refortified. At nine months it was placed in the heating-chamber, at a temperature of 100°, for three months. At eighteen months it was bright and improved; it had some bouquet and flavor, but was too acid and did not promise to be anything fine; it was racked for the fourth time. Two years later it had improved very much, was smooth, clean-tasting, and of good Sherry flavor. At twenty-seven months it was a good wine and fairly well matured, its chief fault being too high acidity. It was put in glass, and fifteen months later was bright, of good aroma and full flavor. It was a sweet wine of good quality, its only serious fault being too much acidity.

No. 1297. *Verdelho*, from Mission San José. Received October 3, 1890, in good condition, and completely mature. The grapes were smaller than usual. The must showed 25.9% of solid contents by spindle and 0.71% of acid. The temperature of the must at crushing was 67°, and the maximum reached was 81°, on the third day. It was fortified on the fourth day.

At one month the wine was nearly clear, but showed poor quality, lacked aroma, and was too high in acid. Two months later it was bright, had improved a little, but was very flavorless. At this time it had 16% of alcohol and 7.9% of solid contents. Two months later it was refortified. At seven months it was put in the heating-chamber, at a temperature of 105°, for three months. At fifteen months it had improved, was bright, and had acquired a rather pleasing but not marked bouquet. It was, however, too thin and too acid to ever make a good Sherry. At this date it was racked for the fifth time. Two years later it was in good condition, clean-tasting, improved in flavor and aroma, but still too acid and a little too sweet. When four years old it was put in glass, and corked loosely. At five years the wine was in good condition, but not nearly so good a wine as No. 1203, Verdelho, from Fresno. It lacked character and was slightly bitter.

No. 1322. *Verdelho*, from Cupertino. A sample for must analysis was received October 11, 1890, in fair condition, and quite mature, some of the berries being dried up. The must showed 27.65% of solid contents by spindle and 0.55% of acid.

No. 1451. *Verdelho*, from Tulare station. A sample for must analysis was received August 29, 1891, in good condition. The must showed 26.3% of solid contents by spindle and 0.56% of acid.

No. 1466. *Verdelho*, from Fresno. Received August 31, 1891, in good condition. The must showed 29.1% of solid contents by spindle and 0.54% of acid. The grapes were divided into two lots, No. 1466 and No. 1466*a*, which were fermented separately.

No. 1466. The temperature of the must at starting was 66°, and the maximum reached was 76°, on the fourth day. On the seventh day, when the wine was still a little sweet, it was fortified. When the wine was four months old it was bright, straw-colored, full-flavored, and with medium sweetness. A month later it was racked for the second time, and at six months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and a half it was in good condition, with full aroma, good Sherry taste, clean and smooth—a very good wine. At three years and two months it was in excellent order and had matured well. It was put in glass, and at four years and five months was a good, full-flavored Sherry.

No. 1466*a*. The temperature of the must at starting was 66°. The day after crushing, one third of a gallon of spirits of 70% strength was added, thus fortifying the must to a strength of 4.6% of alcohol. The maximum temperature of the must was 74°, reached on the fourth day. The wine continued fermenting for fifteen days, when it was fortified with the necessary quantity of spirits. At four months the wine was bright, straw-colored, of medium sweetness, slightly bitter, and not as good as No. 1466. A month later it was racked, and at six months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and a half, it differed little from No. 1466, except that it was slightly less acid. At three years and two months it was very good, of excellent flavor and aroma, and maturing well. It was put in glass, and at four years and five months it was brighter and smoother than No. 1466, but otherwise little different.

No. 1485. *Verdelho*, from Paso Robles station. A sample for must analysis was received September 9, 1891, in good condition. The must showed 24.1% of solid contents by spindle and 0.55% of acid.

No. 1518. *Verdelho*, from Mission San José. Received October 19, 1891, in good condition. The must showed 26.05% of solid contents by spindle and 0.71% of acid. The must commenced fermenting at a temperature of 67°, and reached a maximum of 76°, on the fourth day. On the ninth day, while the wine was still sweet, it was fortified.

At three months the wine was bright and clean-tasting; both the acid and the sugar were a little too high. At four months it was racked for the second time, and at five months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and nine months it was bright, of good aroma and flavor, and clean-tasting; it was smooth and agreeable, but a little too sweet. Four months later it had not changed much, had developed little of the Sherry flavor, and the acid was a little too high. At four years and four months it had improved very much, was clean-tasting, and had developed a good aroma; it was a very good Sherry.

No. 1689. *Verdelho*, from Tulare station. Received September 29, 1892, in good condition. The must showed 25.9% of solid contents by spindle and 0.49% of acid. The temperature of the grapes at crushing was 72°, and the maximum reached was 79°, on the second day. On the fifth day the wine was fortified.

In ten weeks the wine was bright, but not agreeable. At five months it was racked for the second time, refortified, and sweetened by the addition of a little sugar. When twelve months old it was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and two months it was in good order, showed character, but was not quite clean-tasting, nor equal to Beba and Pedro Jimenes of the same age in smoothness and development. Fourteen months later it had improved and showed marked character, but was still a little raw-tasting.

No. 1859. *Verdelho*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The grapes were small and sweet, and in small, loose bunches. The must showed 26.1% of solid contents by spindle and 0.63% of acid.

No. 1904. *Verdelho*, from Tulare station. Received October 2, 1893, in good condition. The bunches were small, well filled, but not compacted; the berries were large for the variety, and mature. The must showed 25.75% of solid contents by spindle and 0.58% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 86°, on the third day. The wine was fortified on the fifth day.

At two months the wine was bright and of good aroma, but too dry. It was racked for the second time, and at eight months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At eleven months it was racked again, and at fourteen months it was smooth and agreeable, but undeveloped and slightly bitter. At two years and four months it was bright, of good flavor and aroma; a good Sherry, but still rather raw.

No. 2013. *Verdelho*, from Mission San José. A sample for must analysis was received October 26, 1893, in good condition. The bunches were of small to medium size, branching, showing some coulure; the berries small and very sweet. The must showed 28.4% of solid contents by spindle and 0.55% of acid.

No. 2102. *Verdelho*, from Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were small, irregularly conical, with small wings, loose, and showing some coulure; the berries small, pulpy, very sweet, and much past maturity. The must showed 27.7% of solid contents by spindle and 0.44% of acid.

BOAL DE MADEIRA.

(See Vit. Rept. 1883-85, p. 136.)

The variety imported into California under the above name is probably one of the several varieties of Boal which are widely distributed in Portugal. As no adequate descriptions of these varieties are available, it is impossible to say which we have. The chief varieties are the *Boal cachudo* or *commun*, and the *Boal calhariz;* these are grown extensively in many localities, and are generally very productive and satisfactory as to the quality of the wine. The Boal is said to be adapted to divers soils, the grapes ripen early, and are easily injured by wet weather.

Description.—Canes slender and short-jointed; leaves of medium size, longer than broad, with five well-marked sinuses and occasionally two or three secondary ones, lobes overlapping, upper surface with loose, flocculent wool, disappearing at maturity, lower surface closely white-woolly, teeth irregular and acuminate; bunches large, branching, loose;

berries small, ellipsoidal, soft, and juicy, on long and slender pedicels; skin fairly thick, but tender.

The Boal in California has, so far, given small to fair crops, except at Natoma, where it is said to have borne heavily. This is in accordance with the reports from Portugal, where, in some districts, it is considered a heavy bearer, and in others as a light one. It ripens rather later than the Verdelho, and is equally subject to coulure. The average composition of the must has been: at Mission San José and Cupertino, 26.0% of sugar and 0.58% of acid; at Tulare and Fresno, 25.75% of sugar and 0.45% of acid; at Amador, 27.58% of sugar and 0.45% of acid; at Paso Robles, 27.55% of sugar and 0.40% of acid. These figures resemble greatly those found for the Verdelho. It attains a high amount of sugar in all localities, and maintains its acid well. This would indicate its value as a grape for dry Sherries. It would make an excellent blend for this purpose with the Verdelho, which has more character. It makes a rather agreeable sweet wine, but no better, if as good, as several Spanish grapes which are much heavier bearers. Altogether this variety shows few good points in which it is not equaled or surpassed by the Verdelho. It is, however, worthy of further trial in the foothill and southern regions.

ANALYSES OF MUSTS AND WINES.

BOAL DE MADEIRA.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Body	Ash	Sugar
1884—No. 273. Natoma Wine Co., Natoma	Sept. 3	21.76	.....	.53	.....	9.27	11.58	.66	2.00	.26	.....
1889—No. 1085. J. Gallegos, Mission San José	Sept. 16	26.30	26.12	.62	.38	10.44	12.91	.48	2.30	.....	.....
1890—No. 1300. J. Gallegos, Mission San José	Oct. 4	25.00	.....	.57	.31	13.77*	17.00	.30	3.14	.....	1.31
No. 1393. J. T. Doyle, Cupertino	Oct. 18	27.15	.....	.48	.....	.....	.....	.....	.....	.....	.....
1891—No. 1473. Fresno	Aug. 29	26.30	.....	.50	.36	17.25*	21.19	.41	3.09	.....	3.09
No. 1570. Mission San José	Oct. 7	26.90	.....	.57	.....	.....	.....	.....	.....	.....	.....
1893—No. 1873. Amador station	Sept. 14	25.60	.....	.53	.....	.....	.....	.....	.....	.....	.....
No. 1951. Mission San José	Oct. 14	24.80	.....	.90	.....	.....	.....	.....	.....	.....	.....
No. 1962. Paso Robles	Oct. 16	26.50	.....	.34	.....	.....	.....	.....	.....	.....	.....
No. 2095. Cupertino	Nov. 4	28.40	.....	.45	.....	.....	.....	.....	.....	.....	.....
1894—No. 2140. Amador station	Sept. 11	29.55	.....	.37	.....	.....	.....	.....	.....	.....	.....
No. 2213. Paso Robles	Sept. 24	28.60	.....	.45	.....	.....	.....	.....	.....	.....	.....
No. 2248. Mission San José	Oct. 3	23.70	.....	.48	.....	.....	.....	.....	.....	.....	.....
No. 2331. Tulare	Oct. 13	25.20	.....	.40	.....	.....	.....	.....	.....	.....	.....

*Fortified.

RECORD OF TREATMENT.

No. 1085. *Boal de Madeira*, from Mission San José. Received September 19, 1889, in poor condition; many grapes were dried up. The bunches were rather large, branching, loose; the berries small, ellipsoidal; stems and pedicels long and slender; flesh firm and agreeably flavored; skin thick, but tender. The must showed 26.3% of solid contents by spindle and 0.62% of acid. The yield from the 62.5 lbs. crushed was 4.4 gals., or at the rate of 140 gals. per ton. The temperature of the grapes at crushing was 71°, and the maximum reached was 82.5°, on the third day.

The wine was dry on the sixth day, and was drawn off the thick lees. At three weeks it was almost clear, of agreeable flavor, but slightly bitter. Nine days later it was clear and clean-tasting, and was racked and taken to the cellar. At four months it was in good condition, golden-green in color, of agreeable flavor, and good body, acid, and alcohol. The taste was still a little bitter, but the lees showed no bad germs. At seven months the wine was racked again; it was bright, but had a suspicious taste, and the lees showed some filaments. A month later it had become cloudy, and was pasteurized. After this it did not improve, as the pasteurizing had been done too late and after the flavor had already been impaired. The wine, however, became no worse, and at eighteen months it was distilled.

No. 1300. *Boal de Madeira*, from Mission San José. Received October 7, 1890, in poor condition. The must showed 25.0% of solid contents by spindle and 0.57% of acid. The temperature of the grapes at crushing was 67°, and the maximum reached was 73°, on the third day. On the fifth day the wine was fortified.

At one month the wine was clear, with little flavor or aroma, moderate alcohol and acid, and right amount of sweetness. At three months it was bright and improved, but tasted somewhat bitter, and the spirits had not become well incorporated. It was racked for the second time, and two months later refortified. At seven months it was put in the heating-chamber, at a temperature of 105°, for three months. At sixteen months the wine had much improved, had developed some bouquet, and was of very pleasing flavor. It was racked again, and two years later it had retained its good qualities, but, owing to the smallness of the quantity, it had become too concentrated by evaporation. At four years it was in excellent order, mature and good, but not quite clean-tasting; at this date it was bottled. At five years and four months it was in good condition, full-flavored and mature, with strong "rancio" taste, but lacking in delicacy.

No. 1393. *Boal de Madeira*, from Cupertino. A sample for must analysis was received October 21, 1890, in poor condition, many grapes being crushed and others dried. The must showed 27.15% of solid contents by spindle and 0.48% of acid.

No. 1473. *Boal de Madeira*, from Fresno. Received August 31, 1891, in good condition. The must showed 26.3% of solid contents by spindle and 0.50% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 77°, on the third day. On the sixth day the wine was fortified.

At four months the wine was bright, of good aroma and flavor, and low sugar contents. A month later it was racked for the second time, and at six months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and ten months it was bright and of good aroma, but a little bitter. The quantity was too small to keep well. Four months later it had improved a little, and was put in glass. At four years and five months it was in good order, had full aroma and strong "rancio" taste, but was not quite clean-tasting.

No. 1570. *Boal de Madeira*, from Mission San José. A sample for must analysis was received October 9, 1891, in good condition. The must showed 26.9% of solid contents by spindle and 0.57% of acid.

No. 1873. *Boal de Madeira*, from Amador station. A sample for must analysis was received September 16, 1893, in good condition. The bunches were large; the berries rather small and quite ripe. The must showed 25.6% of solid contents by spindle and 0.53% of acid.

No. 1951. *Boal de Madeira*, from Mission San José. A sample for must analysis was received October 14, 1893, in good condition. The bunches were large, loose, and straggling, the berries loose. The must showed 24.8% of solid contents by spindle and 0.90% of acid.

No. 1962. *Boal de Madeira*, from Paso Robles station. A sample for must analysis was received October 14, 1893, in fair condition. The bunches were of medium size, loose, irregularly conical; the berries small, oval, soft and juicy, and quite mature. The must showed 26.5% of solid contents by spindle and 0.34% of acid.

No. 2095. *Boal de Madeira*, from Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were of medium size, irregularly conical, branching or winged, loose, and coulured; the berries small, oval, soft, and overripe. Some of the berries were shriveled. The must showed 28.4% of solid contents by spindle and 0.45% of acid.

MALMSEY.*

(See Vit. Rept. 1883-85, p. 128.)

Synonyms: Malvasia Grossa; Malvoisie à gros grains; Vermentino.

The Malmsey, or Vermentino, is cultivated in northern Portugal, Corsica, and the Island of Madeira for wine, and to a limited extent in the south of France as a table-grape. There are two varieties of Malvoisie cultivated in Madeira, but the one to which the famous Malmsey wine, or Madeira Malvoisie, owed its reputation is a smaller grape of higher quality than the Vermentino. The Vermentino, however, makes an excellent sweet wine, both in Madeira and in Corsica, and is much appreciated as a table-grape in parts of southern France.

Description.—Vine fairly vigorous and very productive in rich soils; canes slender; leaves small to medium, with five deep sinuses and overlapping lobes, the bases of the sinuses looking like four or five roundish holes, after the manner of the Cabernet Sauvignon, upper surface glabrous, lower close woolly; bunches very large and irregular, loose, and with large wings; berries large, oval, appressed at the base; peduncles herbaceous and slender; pedicels much enlarged at the base of the berries, and about three times their length; skin very thin, with light bloom; flesh very juicy, and with delicate Muscat aroma.

This variety has borne well at Tulare with short-pruning; it has shown some tendency to coulure, but the bunches are generally well filled. It ripens rather late, but if given time and not allowed to bear too heavily, will attain a high percentage of sugar. It develops little acid, and this, taken together with its high aroma, makes it very suitable for the manufacture of sweet wines or liqueurs. It can be used also in limited quantities to give aroma to common dry white wines in the hot valleys, when these wines are intended for early consumption. The marked aroma of this grape differs considerably from that of the Muscats, being more delicate and its wine more agreeable. The grape would be excellent for the table but for the delicacy of the skin, which makes it unfit for shipping.

ANALYSES OF MUSTS AND WINES.

MALMSEY.	Date of Picking	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol. By Weight	WINE. Alcohol. By Volume	WINE. Total Acid as Tartaric, at Six to Eight Months	WINE. Body	WINE. Ash
1884—No. 275. Natoma	Sept. 7	17.91	.....	.56	....	7.92	9.91	.54	1.60	.16
1892—No. 1698. Tulare	Sept. 28	22.40	.....	.47	....	.....	.....	.....	.....	....
1893—No. 1901. Tulare	Sept. 27	20.60	.....	.45	.38	†	.....	.....	.....	....
No. 1959. Paso Robles	Oct. 12	25.90	.....	.33	....	.....	.....	.....	.....	....
1894—No. 2286. Tulare	Oct. 6	23.15	21.80	.34	....	.....	.....	.....	.....	....

RECORD OF TREATMENT.

No. 1698. *Malmsey*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The grapes were large and thin-skinned. The must showed 22.4% of solid contents by spindle and 0.47% of acid.

No. 1901. *Malmsey*, from Tulare station. Received September 29, 1893, in good condition. The bunches were very large (most of them had been broken up for convenience

* Corruption of Malvoisie, but not the grape so called in California.

† See No. 1900, Pedro Jimenes.

of packing) and irregular, loose, with large wings, showing some coulure; the berries were large, oval, appressed at the base; peduncles herbaceous and slender; pedicels much enlarged at base of berries, which are about three times their length; skin very thin, with light bloom; flesh very juicy, with delicate Muscat aroma. The must showed 20.6% of solid contents by spindle and 0.45% of acid. The grapes were fermented with No. 1900, Pedro Jimenes.

No. 1959. *Malmsey*, from Paso Robles station. A sample for must analysis was received October 14, 1893, in fair condition. The bunches were large, conical, loose; the berries ovoid, juicy, thin-skinned, very well flavored. The must showed 25.9% of solid contents by spindle and 0.33% of acid.

WEST'S WHITE PROLIFIC.

(See Vit. Rept. 1885-86, p. 108.)

The true name of this variety has not yet been ascertained, but under its California name (derived from its introduction by Mr. W. B. West, of San Joaquin County) it has been rather widely distributed, and is planted in notable quantities in many California vineyards.

Description.—Vine vigorous; canes light brown and rather slender; leaves of good size, without or with only two shallow sinuses, glabrous above, loose-woolly beneath, with very short obtuse teeth; bunches medium to large, long conico-cylindrical, loose or compact, occasionally shouldered; berries of medium size, slightly ovoid, juicy, and of neutral flavor.

This variety has been somewhat extensively recommended as a brandy and as a Sherry grape. For the production of brandy there can be no doubt of its value for certain localities. It is an excellent bearer in rich soils, and maintains a good amount of acid, even in the hottest localities. It ferments well, and its neutral character and the absence of any marked aroma render it eminently suitable for the production of light, neutral blending wines in the San Joaquin Valley. For the production of Sherries or other sweet wines, however, it cannot now be recommended in the presence of several much superior grapes. The average composition of the must has been: at Cupertino and Mission San José, 23.2% of sugar and 0.76% of acid; at Fresno and Tulare, 25.1% of sugar and 0.62% of acid; at Paso Robles, 24.7% of sugar and 0.56% of acid; at Amador station, 25.2% of sugar and 0.75% of acid. These figures show that this variety is one of the best we have for maintaining a full amount of acid with high sugar in the warmer parts of the State. While this is a great advantage in the fermentation and handling of the wine when made dry, it detracts from its value when made into a sweet wine. The sweet wines which we have made from it are harsh and lacking in quality. At best they are but neutral blending wines.

TABLE OF PRODUCTION.

WEST'S WHITE PROLIFIC.	Number of Vines.	Total Weight of Grapes, in lbs.	Average per Vine, in lbs.	Date of Picking.
1887—No. 695 (long-pruned). J. T. Doyle, Cupertino	20	332	16.6	Oct. 5
No. 749 (short-pruned). J. T. Doyle, Cupertino	20	100	5.0	Oct. 18
1888—No. 942 (short-pruned). J. T. Doyle, Cupertino	18	395	21.9	Oct. 25
No. 943 (long-pruned). J. T. Doyle, Cupertino	20	430	21.5	Oct. 25
1889—No. 1154. J. T. Doyle, Cupertino	20	550	27.5	Oct. 9

ANALYSES OF MUSTS AND WINES.

WEST'S WHITE PROLIFIC.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months	Volatile Acid	Body	Sugar
1886—No. 500. J. T. Doyle, Cupertino	Sept. 27	20.00	18.89	1.00	.26	7.50	9.36	.77	.....	2.35	.....
No. 505. J. T. Doyle, Cupertino	Sept. 27	19.80	.....	.91	.....	7.71	9.65	.69	.....	2.05	.....
1887—No. 695 (long-pruned). J. T. Doyle, Cupertino	Oct. 5	23.69	24.01	.78	.27	9.05	11.27	.54	.15	2.60	.....
No. 749 (short-pruned). J. T. Doyle, Cupertino	Oct. 18	26.16	25.19	.66	.44	10.35	12.82	.48	.10	2.60	.....
1888—No. 942 (short-pruned). J. T. Doyle, Cupertino	Oct. 25	25.95	26.99	.48	.37						
No. 943 (long-pruned). J. T. Doyle, Cupertino	Oct. 25	25.02	25.76	.60	.28	10.35	12.80	.46	.....	.....	.....
1889—No. 1045. Margherita Vineyard, Fresno	Sept. 2	28.30	28.07	.43	.49	.....	.....	.....	.....	.....	.....
No. 1154. J. T. Doyle, Cupertino	Oct. 9	25.90	.....	.65	.....	.....	.....	.....	.....	.....	.....
1890—No. 1238. Margherita Vineyard, Fresno	Aug. 22	25.20	25.76	.57	.31	.....	.....	.....	.....	.....	.....
No. 1271. J. T. Doyle, Cupertino	Sept. 29	20.60	.....	.86	.31	.....	.....	.....	.....	.....	.....
1891—No. 1465. Fresno	Aug. 28	25.65	.....	.56	.....	*15.25	18.78	.33	.....	2.85	.....
No. 1531. Paso Robles	Oct. 6	24.60	.....	.54	.....	.....	.....	.....	.....	.....	.....
1892—No. 1640. Tulare	Sept. 12	24.35	23.23	.62	.50	*14.82	18.25	.52	.....	2.70	1.50
No. 1754. Paso Robles	Oct. 11	24.10	.....	.57	.....	.....	.....	.....	.....	.....	.....
1893—No. 1872. Amador station	Sept. 16	22.20	.....	1.03	.....	.....	.....	.....	.....	.....	.....
No. 1903. Tulare	Oct. 1	22.40	20.99	.77	.47	8.70	10.83	.44	.....	2.60	.....
No. 1903*a*. Tulare	Oct. 1	.....	.....	.....	.....	.....	16.20	.68	.....	2.82	.98
No. 2034. Cupertino	Nov. 1	21.50	.....	.92	.....	.....	.....	.....	.....	.....	.....
No. 2069. Paso Robles	Nov. 1	25.45	24.64	.58	.32	.....	19.35	.47	.....	2.85	.....
1894—No. 2186. Amador station	Sept. 25	25.90	.....	.70	.....	.....	.....	.....	.....	.....	.....
No. 2221. Tulare	Oct. 1	24.80	22.67	.76	.....	.....	.....	.....	.....	.....	.....
No. 2222. Amador station	Oct. 1	27.60	.....	.53	.....	.....	.....	.....	.....	.....	.....

*Fortified.

RECORD OF TREATMENT.

No. 695. *West's White Prolific*, from Cupertino. Received October 6, 1887, in good condition, and crushed the following day. The bunches were long, loose, and slender, very little affected by coulure; the berries were greenish, bronzed like the Palomino where exposed to the sun. The must showed 23.69% of solid contents by spindle and 0.78% of acid. Fermentation commenced the day of crushing, and reached its maximum temperature of 89°, on the second day. The 110.7 lbs. crushed yielded 8.7 gals., or at the rate of 156 gals. per ton.

At three weeks the wine was drawn off the thick lees. At two months it was bright, thin-bodied, and with high acid; it had less bouquet than No. 749, the sample from short-pruned vines. A microscopic examination of the lees showed acetic germs; the wine was racked again and pasteurized. At seven months it had improved very much, was heavy-bodied, clean-tasting, with pleasant Sherry flavor and well-developed bouquet. At fifteen months it was distilled for brandy.

No. 749. *West's White Prolific*, from Cupertino. Received October 19, 1887, in good condition, and crushed the day of arrival. The bunches were generally well filled, but a few showed a little early coulure; the berries were good and of full size, except for a few abortive ones. The must showed 26.16% of solid contents by spindle and 0.66% of acid. The fermentation reached its maximum on the third day at a temperature of 83°. The yield from 83 lbs. was 6.0 gals., or at the rate of 165 gals. per ton.

In two weeks the wine was drawn off the thick lees and divided into two packages: one of four gallons for dry wine, and the other of two gallons for Sherry. To the latter was added sufficient alcohol to bring it up to 18%, and the sample was put into the heating-chamber, at a temperature of 80°. In two months No. 749 (dry wine) was in good condition, bright, with medium acid and some bouquet. A month later it was racked and pasteurized. At eight months it was a very good wine with low acid, marked flavor, and well-developed bouquet—a promising wine for distillation. At fifteen months it was distilled for brandy. At four months No. 749*a* (Sherry sample) had improved very much. At eight months it was in good order and possessed a good Sherry aroma, but was quite dry. It was sweetened to 5% by the addition of rock-candy. The wine improved and made a good Sherry, but was somewhat deficient in alcohol.

No. 942. *West's White Prolific*, from Cupertino. Received October 26, 1888, in good condition. The grapes were from both long and short-pruned vines, the former looking the best. A few berries were dried up, but they were not generally overripe. The effect of a little coulure was noticeable. The must showed 25.95% of solid contents by spindle and 0.48% of acid. The grapes were crushed the day they arrived, and yielded must at the rate of 159 gals. per ton.

At one month the wine was racked and taken to the cellar. At three months it was clear, good, with pleasing aroma and advanced development. Two months later it was racked again. The lees were examined microscopically at five, sixteen, and twenty-one months, respectively, and no unsound ferments found. At fifteen months the wine was bright, with full and agreeable bouquet and well-developed flavor, but not yet bottle-ripe. At seventeen months it was racked again. At twenty-one months it was bright and good and nearly mature. A month later it was bottled. At two years and five months some wine that had been bottled at five months was examined; it was bright, smooth, and clean-tasting, with full flavor and some bouquet. That bottled at twenty-two months was little different, but with a little less flavor. Eighteen months later the earlier bottled wine had deteriorated, while the later had improved and was very good. At seven years the second bottling was a smooth, pleasing wine, with little bouquet or character.

No. 1045. *West's White Prolific*, from Fresno. A sample for must analysis was received September 5, 1889. The bunches were of medium size or larger, cylindrical, sometimes shouldered; the berries medium sized, firm, and juicy. The must showed 28.3% of solid contents by spindle and 0.43% of acid.

No. 1154. *West's White Prolific*, from Cupertino. A sample for must analysis was received October 10, 1889, in good condition, and mature. The bunches were large, not very compact, cylindrical, and sometimes shouldered. The must showed 25.9% of solid contents by spindle and 0.65% of acid.

No. 1238. *West's White Prolific*, from Fresno. A sample for must analysis was received August 25, 1890, in good condition, but many of the berries dried. The must showed 25.2% of solid contents by spindle and 0.57% of acid.

No. 1271. *West's White Prolific*, from Cupertino. A sample for must analysis was received October 2, 1890, in good condition, but small, tasteless, and unripe. The must showed 20.6% of solid contents by spindle and 0.86% of acid.

No. 1465. *West's White Prolific*, from Fresno. Received August 31, 1891, in good condition. The must showed 25.65% of solid contents by spindle and 0.56% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 74°, on the fourth day. The fermentation was very slow, and on the eighth day was stopped by the addition of spirits.

At four months the wine was bright, with good aroma, and slight sweetness. The next month it was racked for the second time, and at six months put in the hot-box, at

a temperature of from 90° to 95°, for three months. At two years and ten months it was a fair but coarse Sherry, without much flavor or aroma. Four months later it had improved, and was put in glass and loosely corked. At four years and five months it was a coarse Sherry that would be useful as a blend with a smooth, full-flavored wine. It had acquired a very marked "rancio" taste.

No. 1531. *West's White Prolific*, from Paso Robles station. A sample for must analysis received October 8, 1891, in good condition. The bunches were small and compact; the berries small, round-oval, mature. The must showed 24.6 % of solid contents by spindle and 0.54% of acid.

No. 1640. *West's White Prolific*, from Tulare station. Received September 15, 1892, in good condition. The must showed 24.35 % of solid contents by spindle and 0.62% of acid. The temperature of the grapes at crushing was 64°, and the maximum reached was 77°, on the fourth day. The wine was fortified on the fifth day.

In one month the wine was clear and was racked. At three months it was bright and promising, with low acid and slight sweetness. At six months it was refortified and sweetened by the addition of a little rock-candy, racked, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At ten months it was bright, clean-tasting, and neutral. At two years and three months the wine was in good order—a good, clean-tasting, rather thin wine, with little character, but without any positive defects. Blended with one quarter of No. 1619 (Marsanne) it made a good Sherry. At three years and five months it had improved, showed good flavor and aroma, but was rather too high in acid and lacked smoothness.

No. 1754. *West's White Prolific*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 24.1% of solid contents by spindle and 0.57% of acid.

No. 1872. *West's White Prolific*, from Amador station. A sample for must analysis was received September 16, 1893, in good condition, but not mature. The bunches were small, the berries of medium size. There was evidence of some coulure. The must showed 22.2% of solid contents by spindle and 1.03% of acid.

No. 1903. *West's White Prolific*, from Tulare station. Received October 2, 1893, in good condition, and nearly mature, but with a good deal of acid. The bunches were small and rather loose, the berries of medium size. The must showed 22.4% of solid contents by spindle and 0.77% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 87°, on the third day. On the fifth day the wine was still a little sweet, and five gallons were drawn off and fortified. The rest was fermented out dry.

No. 1903 (dry wine). In five weeks the wine was clear and clean-tasting. It was racked and taken to the cellar. At four months it was bright, with little flavor, no aroma, and a slight bitterness. A month later it was racked again, and at six months it showed no improvement; it was flat and without character. At ten months it was no better, and the lees showed some acetic germs; it was racked again and part put in bottle. At thirteen months it was slightly better; it had more body and less acid than the Burger from Tulare, but was inferior to the latter in quality. At nineteen months it was bottled. At two years and four months it was bright and without deposit, lacking in bouquet and flavor, but sound and fairly agreeable.

No. 1903*a* (fortified). At two months it was bright, but too dry. It was racked for the second time, and at five months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At nine months it was racked again, and at two years and four months it was in good order, but a dry and tasteless wine of poor quality.

No. 2034. *West's White Prolific*, from Cupertino. A sample for must analysis was received October 31, 1893, in good condition, but not quite mature. The bunches were of medium size, long, conico-cylindrical, close to compact; the berries of medium size, juicy, thin-skinned, and with full acid. The must showed 21.5% of solid contents by spindle and 0.92% of acid.

No. 2069. *West's White Prolific*, from Paso Robles station. Received November 3, 1893, in fair condition. The bunches were small to medium, well filled, conico-cylindrical, with or without shoulders, sometimes branching; the berries under medium in size, slightly oval, soft and juicy, not quite mature. The must showed 25.45% of solid contents by spindle and 0.58% of acid. The temperature of the grapes at crushing was 69°, and the maximum reached was 78°, on the third day. On the eighth day the wine was fortified.

In five weeks the wine was bright, but too dry. It was racked for the second time, and at four months was put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At eight months it was racked again. At fifteen months it was in good order, rather too dry, of fair aroma and some Sherry taste, but lacking in delicacy and smoothness.

FEHER SZAGOS.

This variety, like the West's White Prolific, was imported from Europe and the name lost. It was presumed, for some reason, to be a Hungarian grape, and in California was given its present name, which is the Hungarian for white grape.

Description.—Vine strong-growing in rich soils, and very productive; leaves small to medium, roundish, generally three-lobed, and with shallow sinuses, glabrous above and nearly so beneath; bunches large, long, and narrow; berries oblong, pendent, loosely placed on long pedicels; skin thin and tender, covered with brown dots; flesh firm.

This vine is an extremely heavy bearer at Fresno with short-pruning. The grapes attain a good percentage of sugar when the crop is not too large, and are low in acid. They have, however, very little character, and make at best a neutral, cutting Sherry. Their lack of acid and character makes them quite unsuited to the production of dry wine.

The fermentation is remarkably slow and steady, but shows little tendency to "go wrong."

ANALYSES OF MUSTS AND WINES.

FEHER SZAGOS.	Date of Picking	MUST.				WINE.						
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Volume.	Alcohol. By Weight.	Total Acid as Tartaric, at Six to Eight Months	Volatile Acid	Body	Ash	Sugar
1881—No. 24. G. Eisen, Fresno		17.15	19.54	.32	-----	8.22	8.54	.56	-----	1.68	.39	-----
No. 25 G. Eisen, Fresno		17.15	19.54	.32	-----	10.20	10.60	.53	-----	1.99	.44	-----
1887—No. 798.† Margherita Vineyard, Fresno	Nov. 11	26.81	26.99	.17	.68	9.73	7.78	.77	.36	-----	-----	-----
1890—No. 1213. Margherita Vineyard, Fresno	Aug. 22	22.40	21.97	.40	.40	-----	*15.50	.39	-----	2.38	-----	1.42
1891—No. 1503. Fresno	Sept. 20	23.70	23.62	.32	-----	19.08	-----	-----	-----	-----	-----	-----

*Fortified. †Overripe.

RECORD OF TREATMENT.

No. 798. *Feher Szagos*, from Fresno. Received November 14, 1887, in fair condition, overripe and flabby, but generally sound. The bunches were long and narrow, occasionally shouldered; the berries were large, oblong, pendent, loosely placed on long pedicels; the skin was thin and tender, covered with brown dots; the flesh was solid and gelatinous. About 15% of the grapes were half-raisins; they tasted very astringent for a white grape. The must showed 26.81% of solid contents by spindle and 0.17% of acid. The grapes (125 lbs.) were thoroughly crushed and the mash aërated from time to time for twenty-four hours, when it was pressed. On the second day after crushing the fermentation was so slow that the must was put in the heating-chamber, at a temperature of 85°. It fermented slowly and its temperature did not rise above the temperature of the room.

At one month the wine was drawn off the thick lees and left in the hot chamber. At two months wine-flowers appeared and the wine had a slight acetic smell, so it was drawn off and pasteurized. At this date it had 9% of solid contents and it was fortified up to 18% of alcohol. A month later it was bright and improved, but quite neutral and too sweet. At eight months it was in good order and had improved in bouquet and in quality generally.

No. 1213. *Feher Szagos*, from Fresno. A sample for must analysis was received August 25, 1890, in poor condition. The grapes were quite ripe, and the must showed 22.4% of solid contents by spindle and 0.40% of acid.

No. 1503. *Feher Szagos*, from Fresno. Received September 25, 1891, in good condition. The must showed 23.7% of solid contents by spindle and 0.32% of acid. The temperature of the grapes at crushing was 70°, and the maximum reached was 77°, on the third day. The fermentation was very slow, and it was not till the eighteenth day that the wine was dry enough to fortify.

At three months the wine was clear, fresh, and clean-tasting, with rather high sweetness. At five months it was racked for the third time, and at six months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and ten months it was bright, a perfectly neutral wine, without positive defects, but lacking altogether in flavor and aroma. It would make an excellent neutral blend with some highly flavored Sherry. Four months later it was put in glass; it was very clean-tasting, but without character. At four years and five months it was well advanced toward maturity, was smooth and clean-tasting, but showed little flavor or aroma.

MUSCATEL.

(See Vit. Rept. 1885, p. 103.)

Synonyms: Muscat blanc de Frontignan; White Frontignan; Muskateller; Weisse Muscattraube; Moscatello bianco.

Description.—Vine of medium size, with strong, spreading canes; canes reddish-brown, with short internodes; leaves of medium size, thin, five-lobed, glabrous, except for a few hairs on the lower side of the well-marked ribs; bunches long, cylindrical, regular, compact; berries round, golden-yellow, becoming amber-colored, very sweet and of marked aroma. Ripens a little later than the Chasselas.

The Muscatel in some one of its many forms is cultivated in almost every country where vines are grown. It is highly esteemed as an early table-grape wherever its poor shipping qualities do not preclude its use; several forms, such as Silver Frontignan, Auvergne Frontignan, Grisely Frontignan, are grown in English hothouses. The Muskateller is grown widely, but not in large quantities, all over Austria, Hungary, and parts of Germany, where it is used principally as an addition to neutral grapes lacking in aroma. In Italy several yellowish and pinkish variations are grown. In southern countries the berries are larger, but the aroma is less marked than in cooler climates. The principal importance of the Muscatel comes from the fact that from it are made the famous "vins de liqueur" of Frontignan in southern France. In making these wines the grapes are allowed to remain on the vines till they have reached the last stages of ripening or even have become half-raisins. These wines are held in such high esteem that it is worth

while to attempt to reproduce them in California. In fact, some very creditable sweet Muscatel has already been made here, but it must be kept in mind that only from grapes grown on dry hillsides and allowed to reach the last stages of maturity can anything approaching the wines of Frontignan be made.

The Muscatel should not be planted in situations liable to spring frosts, on account of the early starting of the buds. Like many varieties of ancient origin, it is liable to degenerate and give rise to sports that produce abortive berries without seeds and about the size of peas. On this account great care should be exercised in the choice of cuttings. On account of the peculiar attractive aroma of this grape it is more subject to the attacks of animals and insects than any other. Deer and rabbits will single out a vine of this variety from a whole vineyard for their attacks. Insects are so partial to the grapes that the Romans, who had several varieties of Muscat, called them "Apianæ," from "apis," a bee. Our modern name of Muscat has a similar signification, being derived from the Latin "musca," a fly.

Though the Muscat flavor is in such high repute for "vins de liqueur" in Europe, it seems somewhat discredited in California. This is doubtless due to the use of the Muscat of Alexandria, which is much inferior to the Muscatel for this purpose. The natural aroma of all grapes is strongest in the wine when it is new, and in time becomes feebler, and at last is completely lost. The Muscatel has the most pronounced and the most persistent of all grape aromas, and the wine does not completely lose it for twelve or more years. As the natural aroma disappears, the wine acquires a "gout de rance," which is very delicate and agreeable.

ANALYSES OF MUSTS.

MUSCATEL.	Date of Picking	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash
1889—No. 1024. Fresno	Aug. 31	25.00	25.19	.42	.47
1890—No. 1215. Fresno	Aug. 23	23.30	23.13	.41	.34
1893—No. 1963. Paso Robles	Oct. 12	29.65	------	.34	------
No. 1998. Tulare	Oct. 17	26.95	------	.47	------

RECORD OF TREATMENT.

No. 1024. *Early Silver Frontignan*, from Margherita Vineyard, Fresno. Grapes arrived September 2, 1889, in fair condition, but only in small quantity for must analysis. Bunches large, pyramidal, and winged; grapes medium size, close, round, and golden-green colored; flesh soft, with a strong Muscat flavor; skin thin and easily broken. Juice showed 25.0% of solid contents and 0.42% of acid.

No. 1215. *Early Silver Frontignan*, from Fresno. A sample for must analysis was received August 25, 1890, in bruised condition. The grapes were very ripe, but only showed 23.3% of solid contents by spindle and 0.41% of acid.

No. 1963. *Muscatel*, from Paso Robles station. A sample for must analysis was received October 14, 1893, in good condition. The bunches were of medium size, close, cylindrical, with or without a small shoulder or wing; the berries were round, of medium size, overripe, commencing to dry up. The grapes were from long-pruned vines growing in sandy soil and bearing a very small crop—about one and a half tons per acre. The must showed 29.65% of solid contents and 0.34% of acid.

No. 1998. *Muscatel*, from Tulare station. A sample for must analysis was received October 19, 1893, in good condition. The grapes were a mixture of first and second crop. The first was overripe and dried up, while the second was not quite ripe. The must showed 26.95% of solid contents by spindle and 0.47% of acid.

MALVASIA BIANCA.

Synonym: Malvoisie blanche du Piedmont.

Description.—Vine fairly vigorous, with light-brown wood; leaves three-lobed, with shallow sinuses, glabrous above, woolly beneath, with short, sharp teeth; bunches over average in size, conico-cylindrical, winged, well filled but not compressed, on long, thin peduncles; berries round, small to average in size, with thick, tough skin and light bloom, color green, with a pinkish tint on the ripest grapes, flesh soft and juicy, with a delicate Muscat aroma.

This variety is widely cultivated in Piedmont and is used for the production of sweet wines and "vins de liqueur." At Asti, Italy, it is employed to some extent in the production of sparkling wines. It is an agreeable eating-grape with a delicate Muscat flavor, but is too soft and juicy to be grown extensively for this purpose.

ANALYSES OF MUSTS.

MALVASIA BIANCA.	Date of Picking.	Solid Contents by Spindle.	Acid as Tartaric.
1890—No. 1360. Cupertino	Oct. 17	26.10	.65
1891—No. 1532. Paso Robles	Oct. 6	26.95	.31
1892—No. 1756. Paso Robles	Oct. 11	26.50	.24
1893—No. 2105. Cupertino	Nov. 5	25.90	.74

RECORD OF TREATMENT.

No. 1360. *Malvasia bianca*, from Cupertino. Received October 17, 1890, in good condition, but rather softened by the rain. The bunches were over average in size, conico-cylindrical, well filled, but not compressed; the berries were round, small to average, on long, thick pedicels; the skin was thick, tough, with a light bloom and of a pinkish color. The must showed 26.1% of solid contents by spindle and 0.65% of acid. The temperature of the grapes at crushing was 66°, and the maximum reached was 79°, on the fourth day. On the seventh day the wine was dry and was racked off.

At one month the wine was bright, of slightly pinkish tint, strong aroma, full flavor, clean taste, medium acid, and, in general, of good quality. A month later it was racked for the second time. At two and at three months the lees were examined and no unsound germs found. At three months the wine was still in good condition; it was racked for the third time; it was full-bodied and with high alcohol, but still tasted raw. Two months later the lees showed some unsound germs and the wine was pasteurized. At seven months it was bright, maturing well, with strong flavor and aroma. At fifteen months it was bright, with rich Muscat aroma, fresh and clean taste, nearly mature. Eight months later it was bottled. At three years the bottled wine had deteriorated and made a heavy deposit in bottle; it had been bottled too soon.

No. 1532. *Malvasia bianca*, from Paso Robles. A sample for must analysis was received October 8, 1891, in fair condition, but a little moldy. The bunches and grapes were of average size; the berries thin-skinned and tender. The grapes were mature, and the must showed 26.95% of solid contents by spindle and 0.31% of acid.

No. 1756. *Malvasia bianca*, from Paso Robles. A sample for must analysis was received October 13, 1892, in good condition. The must showed 26.5% of solid contents by spindle and 0.24% of acid.

No. 2105. *Malvasia bianca*, from Cupertino. A sample for must analysis was received November 7, 1893, in good condition. The bunches were of medium size, conico-cylindrical, slightly shouldered; the berries of medium size, soft, juicy, with thick skins, and a delicate Muscat aroma. The must showed 25.9% of solid contents by spindle and 0.74% of acid.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SHERRY AND MADEIRA TYPE.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Total Acid, as Tartaric, at 6 to 8 Months	WINE. Body
	Pedro Jimenes.								
266	Natoma	1884	20.78	20.61	.33	.40	12.00	.56	1.18
484	Natoma	1886	19.30	18.89	.38	.35	9.73	.59	2.00
784	Cupertino	1887	21.26	20.61	.45	.40	9.36	.68	2.30
953	Cupertino	1888	19.40	19.89	.35	.48	9.54	.36	2.40
1191	Cupertino	1889	20.06	.....	.25	.41	*17.70	.21	4.00
1404	Cupertino	1890	19.70	.....	.47	.23	*17.20	.33	2.08
2036	Cupertino	1893	23.70	.....	.47	.....	.....	.....	.....
1244	Fresno	1890	21.20	20.39	.41	.61	*20.06	.30	2.77
1502	Fresno	1891	23.70	23.13	.45	.....	*19.08	.30	2.61
1502a	Fresno	1891	23.70	23.13	.45	.....	*20.06	.27	.....
1352	Mission San José	1890	22.30	.....	.42	.....	*17.40	.34	2.48
1606	Mission San José	1891	24.80	.....	.49	.37	*21.19	.20	3.31
1779	Mission San José	1892	23.15	22.67	.50	.....	11.55	.53	2.60
2246	Mission San José	1894	22.30	.....	.42	.....	.....	.....	.....
1670	Tulare	1892	22.60	21.38	.33	.47	*18.25	.38	2.55
1900	Tulare	1893	22.20	21.80	.41	.43	.....	.....	.....
2350	Tulare	1894	23.90	.....	.29	.....	.....	.....	.....
1853	Amador station	1893	19.30	.....	.53	.....	.....	.....	.....
2164	Amador station	1894	21.50	.....	.58	.....	.....	.....	.....
1916	Paso Robles	1893	21.50	21.00	.40	.38	*18.25	.35	2.85
2214	Paso Robles	1894	21.50	.....	.49	.....	.....	.....	.....
	Average, Natoma	.....	**20.04**	**19.75**	**.36**	**.38**	**10.86**	**.58**	**1.59**
	Average, Cupertino	.....	**20.82**	**20.25**	**.40**	**.38**	**9.45**	**.52**	**2.35**
	Average, Fresno	.....	**22.87**	**22.22**	**.43**	**.61**	.....	**.27**	.....
	Average, Mission San Jose	.....	**23.14**	**22.67**	**.46**	**.37**	.....	**.36**	.....
	Average, Tulare	.....	**22.90**	**21.59**	**.34**	**.45**	.....	**.38**	.....
	Average, Amador station	.....	**20.40**	.....	**.56**	.....	.....	.....	.....
	Average, Paso Robles	.....	**21.50**	**21.00**	**.45**	**.38**	.....	**.35**	.....
	Palomino.								
504	Cupertino	1886	16.30	15.68	.53	.27	8.00	.59	1.55
765	Cupertino. (Long-pruned)	1887	23.09	22.67	.42	.44	12.18	.44	2.60
698	Cupertino. (Long-pruned)	1887	19.57	19.75	.37	.38	9.36	.49	2.10
728	Cupertino. (Short-pruned)	1887	23.30	22.67	.47	.37	12.09	.47	2.60
952	Cupertino	1888	21.57	22.67	.18	.36	10.91	.52	2.05
951	Cupertino	1888	21.39	21.80	.24	.34	10.36	.42	2.30
1198	Cupertino	1889	23.70	23.13	.22	.42	11.27	.39	1.95
1311	Cupertino	1890	20.85	.....	.43	.27	11.73	.38	2.10
1397	Cupertino	1890	24.60	.....	.31	.....	.....	.....	.....
2067	Cupertino	1893	24.80	.....	.47	.....	.....	.....	.....
547	Mission San José	1886	23.70	.....	.55	.....	.....	.....	.....
727	Mission San José. (Long pruned)	1887	22.00	20.85	.35	.40	11.09	.47	2.40
1171	Mission San José	1889	23.05	23.13	.38	.33	*19.00	.32	3.01
1423	Mission San José	1890	28.00	.....	.34	.....	.....	.....	.....
1519	Mission San José	1891	25.45	.....	.53	.....	.....	.....	.....
1780	Mission San José	1892	20.50	19.75	.55	.....	10.25	.59	2.55
2019	Mission San José	1893	22.90	21.38	.61	.35	*17.70	.48	4.30
2251	Mission San José	1894	22.40	.....	.41	.....	.....	.....	.....
267	Natoma	1884	23.86	23.81	.32	.40	13.50	.53	1.85
384	San José	1885	.....	.....	.....	.....	13.00	.57	2.18
683	Livermore	1887	22.60	22.58	.38	.40	11.36	.47	2.40
1041	Fresno	1889	25.00	25.19	.18	.65	*17.20	.44	2.35
1239	Fresno	1890	23.92	23.42	.34	.33	*18.25	.25	2.48
1476	Fresno	1891	24.10	23.62	.36	.48	*20.00	.11	2.45
1654	Paso Robles	1892	21.30	20.21	.39	.31	*19.28	.38	2.55
1671	Tulare	1892	23.70	22.67	.32	.48	*18.98	.37	2.55
1843	Tulare	1893	21.95	20.24	.38	.52	*18.88	.32	4.00

*Fortified.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SHERRY AND MADEIRA TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST.				WINE.		
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Total Acid as Tartaric, at 6 to 8 Months	Body
	Palomino—Continued.								
1979	Tulare	1893	23.70	22.23	.26	.39			
2154	Tulare	1894	24.00		.28				
2292	Tulare	1894	24.60	24.01	.26				
1875	Amador station	1893	20.60		.47				
2165	Amador station	1894	24.05	22.67	.44				
2166	Amador station	1894	24.40	23.13	.38				
	Average, Cupertino		**21.92**	**21.19**	**.36**	**.36**	**10.74**	**.46**	**2.16**
	Average, Mission San Jose		**11.00**	**21.28**	**.46**	**.36**	**10.67**	**.53**	**2.47**
	Average, Fresno		**24.34**	**24.08**	**.29**	**.49**			
	Average, Tulare		**23.59**	**22.29**	**.30**	**.46**			
	Average, Amador station		**23.02**	**22.90**	**.43**				
	Beba.								
271	Natoma	1884	22.60		.25		14.27	.50	2.10
1676	Tulare	1892	23.70		.26		*19.18	.38	2.92
1816	Tulare	1893	21.05	20.61	.38	.67	*17.20	.41	2.90
2169	Tulare	1894	24.80	24.12	.26				
1854	Amador station	1893	22.60		.47				
2163	Amador station	1894	25.20		.38				
1965	Paso Robles	1893	27.21		.29				
	Average, Tulare		**23.18**	**22.37**	**.30**	**.67**	*18.19	**.40**	**2.91**
	Average, Amador station		**23.90**		**.43**				
	Perruno.								
268	Natoma	1884	22.76		.31	.31	12.35	.52	1.95
1687	Tulare	1892	22.60	22.23	.29	.40	*19.96	.28	2.48
1905	Tulare	1893	22.20	20.61	.41	.34	*19.00	.48	2.88
2289	Tulare	1894	22.85	22.04	.35				
1874	Amador station	1893	18.40		.51				
2184	Amador station	1894	24.10		.39				
1958	Paso Robles	1893	26.30		.15				
	Average, Tulare		**22.55**	**21.63**	**.35**	**.37**	*19.48	**.38**	**2.65**
	Average, Amador station		**21.25**		**.45**				
	Mantuo de Pilas.								
269	Natoma	1884	18.63		.35		9.82	.53	1.32
477	Natoma	1885	20.40	20.02	.37	.42	9.73	.45	
497	Natoma	1885	20.40		.28		10.58	.35	
1688	Tulare	1892	23.50	23.42	.37	.58	*18.03	.31	2.53
1966	Tulare	1893	21.50	20.17	.38	.48	*17.50	.35	3.30
2332	Tulare	1894	23.30	22.23	.32				
1877	Amador station	1893	19.30		.50				
2182	Amador station	1894	22.10		.40				
1957	Paso Robles	1893	22.75		.30				
	Average, Natoma		**19.81**	**20.02**	**.47**	**.42**	**10.06**	**.44**	**1.32**
	Average, Tulare		**22.77**	**21.94**	**.36**	**.43**			
	Average, Amador station		**20.70**		**.45**				
	Mourisco branco.								
270	Natoma	1884	22.60		.25		14.27	.50	2.10
482	Natoma	1885	25.10	24.97	.31	.40	12.54	.33	
1716	Tulare	1892	23.40		.33				
1970	Tulare	1893	23.50	21.80	.32	.34	*19.08	.30	3.10
2312	Tulare	1894	22.60		.30				
1876	Amador station	1893	18.20		.60				
2183	Amador station	1894	20.00		.49				
	Average, Natoma		**23.85**	**24.97**	**.28**	**.40**	**13.40**	**.42**	**2.10**
	Average, Tulare		**23.17**	**21.80**	**.32**	**.34**			
	Average, Amador station		**19.10**		**.54**				

*Fortified.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SHERRY AND MADEIRA TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST. Solids Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Total Acid as Tartaric at 6 to 8 Months	WINE. Body
	Verdelho.								
272	Natoma	1884	27.35	25.88	.50	.37	*15.20	.42	2.82
568	Mission San José	1886	25.90	.....	1.00	.....	.....	.....	.....
838	Mission San José	1888	26.42	.....	.57	.....	.....	.....	.....
914	Mission San José	1888	28.22	.....	.34	.32	*15.20	.41	2.95
1297	Mission San José	1890	25.90	.....	.71	.22	*16.98	.72	3.06
1518	Mission San José	1891	26.05	26.99	.71	.....	*19.78	.51	3.80
2013	Mission San José	1893	28.40	27.70	.55	.30	.....	.....	.....
2249	Mission San José	1894	24.60	.....	.55	.....	.....	.....	.....
766	Cupertino	1887	30.04	31.48	.49	.45	.....	.....	.....
867	Cupertino	1888	24.15	24.33	.46	.26	12.27	.64	2.70
1100	Cupertino	1889	26.90	26.99	.54	.40	13.27	.44	2.86
1322	Cupertino	1890	27.65	.....	.55	.....	.....	.....	.....
2102	Cupertino	1893	27.70	.....	.44	.....	.....	.....	.....
1203	Fresno	1890	24.10	24.64	.65	.52	*18.22	.55	2.96
1466	Fresno	1891	29.10	.....	.54	.....	*20.71	.45	2.99
1451	Tulare	1891	26.30	.....	.56	.....	.....	.....	.....
1689	Tulare	1892	25.90	27.65	.49	.....	*20.24	.36	2.95
1904	Tulare	1893	25.75	25.76	.58	.43	*19.90	.53	3.10
2220	Tulare	1894	27.15	26.31	.49	.....	.....	.....	.....
1485	Paso Robles	1891	24.10	.....	.55	.....	.....	.....	.....
2219	Paso Robles	1894	26.06	.....	.66	.....	.....	.....	.....
1859	Amador station	1893	26.10	.....	.63	.....	.....	.....	.....
2180	Amador station	1894	27.35	.....	.45	.....	.....	.....	.....
	Average, Mission San Jose	.....	**26.49**	**27.34**	**.57**	**.28**	.....	.....	.....
	Average, Cupertino	.....	**27.29**	**27.60**	**.49**	**.37**	**12.77**	**.54**	**2.78**
	Average, Fresno	.....	**27.43**	**24.64**	**.58**	**.52**	.....	.....	.....
	Average, Tulare	.....	**26.27**	**26.57**	**.53**	**.43**	.....	.....	.....
	Average, Paso Robles	.....	**25.08**	.....	**.60**	.....	.....	.....	.....
	Average, Amador station	.....	**26.72**	.....	**.54**	.....	.....	.....	.....
	Boal de Madeira.								
273	Natoma	1884	21.76	.....	.53	.....	11.58	.66	2.00
1085	Mission San José	1889	26.30	26.12	.62	.38	12.91	.48	2.30
1300	Mission San José	1890	25.00	.....	.57	.31	*17.00	.30	3.14
1570	Mission San José	1891	26.90	.....	.57	.....	.....	.....	.....
1951	Mission San José	1893	24.80	.....	.90	.....	.....	.....	.....
2248	Mission San José	1894	23.70	.....	.48	.....	.....	.....	.....
1393	Cupertino	1890	27.15	.....	.48	.....	.....	.....	.....
2095	Cupertino	1893	28.40	.....	.45	.....	.....	.....	.....
1473	Fresno	1891	26.30	.....	.50	.36	*21.19	.41	3.09
1873	Amador station	1893	25.60	.....	.53	.....	.....	.....	.....
2140	Amador station	1894	29.55	.....	.37	.....	.....	.....	.....
1962	Paso Robles	1893	26.50	.....	.34	.....	.....	.....	.....
2213	Paso Robles	1894	28.60	.....	.45	.....	.....	.....	.....
2331	Tulare	1894	25.20	.....	.40	.....	.....	.....	.....
	Average, Cupertino	.....	**25.34**	**26.12**	**.65**	**.35**	**12.91**	**.48**	**2.30**
	Average, Mission San Jose	.....	**27.78**	.....	**.47**	.....	.....	.....	.....
	Average, Amador station	.....	**27.58**	.....	**.45**	.....	.....	.....	.....
	Average, Paso Robles	.....	**27.55**	.....	**.40**	.....	.....	.....	.....
	Malmsey.								
275	Natoma	1884	17.91	.....	.56	.....	9.91	.54	1.60
1698	Tulare	1892	22.40	.....	.47	.....	.....	.....	.....
1901	Tulare	1893	20.60	.....	.45	.38	.....	.....	.....
2286	Tulare	1894	23.15	21.80	.34	.....	.....	.....	.....
1959	Paso Robles	1893	25.90	.....	.33	.....	.....	.....	.....
	Average, Tulare	.....	**22.05**	**21.80**	**.42**	.....	.....	.....	.....

*Fortified.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF SHERRY AND MADEIRA TYPE—Continued.

Number	LOCALITY.	Vintage of	MUST.				WINE.		
			Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol by Volume	Total Acid as Tartaric, at 6 to 8 Months	Body
	West's White Prolific.								
500	Cupertino	1886	20.00	18.89	1.00	.26	9.36	.77	2.35
505	Cupertino	1886	19.80		.91		9.65	.69	2.05
695	Cupertino. (Long-pruned)	1887	23.69	24.01	.78	.27	11.27	.54	2.60
749	Cupertino. (Short-pruned)	1887	26.16	25.19	.66	.44	12.82	.48	2.60
942	Cupertino. (Short-pruned)	1888	25.95	26.99	.48	.37	12.80	.46	
943	Cupertino. (Long-pruned)	1888	25.02	25.76	.60	.28			
1154	Cupertino	1889	25.90		.65				
1271	Cupertino	1890	20.60		.86	.31			
2034	Cupertino	1893	21.50		.92				
1045	Fresno	1889	28.30	28.07	.43	.49			
1238	Fresno	1890	25.20	25.76	.57	.31			
1465	Fresno	1891	25.65		.56		*18.78	.33	2.85
1531	Paso Robles	1891	24.60		.54				
1754	Paso Robles	1892	24.10		.57				
2069	Paso Robles	1893	25.45	24.64	.58	.32	*19.35	.47	2.85
1640	Tulare	1892	24.35	23.23	.62	.50	*18.25	.52	2.70
1903	Tulare	1893	22.40	20.99	.77	.47	*10.83	.44	2.60
2221	Tulare	1894	24.80	22.67	.76				
1872	Amador station	1893	22.20		1.03				
2186	Amador station	1894	25.90		.70				
2222	Amador station	1894	27.60		.53				
	Average, Cupertino		**25.34**	**25.49**	**.63**	**.34**	**12.29**	**.49**	**2.60**
	Average, Fresno		**26.38**	**26.92**	**.52**	**.40**			
	Average, Paso Robles		**24.72**	**24.64**	**.56**	**.32**			
	Average, Tulare		**23.85**	**22.29**	**.72**	**.48**			
	Average, Amador station		**26.75**		**.62**				
	Feher Szagos.								
24	Fresno	1881	17.15	19.54	.32		8.22	.56	1.68
25	Fresno	1881	17.15	19.54	.32		10.20	.53	1.99
789	Fresno	1887	26.81	26.99	.17	.68	*9.73	.77	
1213	Fresno	1890	22.40	21.97	.40	.40			
1503	Fresno	1891	23.70	23.62	.32		*19.08	.39	2.38
	Average, Fresno		**21.44**	**22.33**	**.31**	**.54**	**9.21**	**.55**	**1.88**
	Muscatel.								
1024	Fresno		25.00	25.19	.42	.47			
1215	Fresno	1889	23.30	23.13	.41	.34			
1963	Paso Robles	1890	29.65		.34				
1998	Tulare	1893	26.95		.47				
	Average, Fresno	1893	**24.15**	**24.16**	**.41**	**.40**			
	Malvasia bianca.								
1360	Cupertino		26.10		.65				
2105	Cupertino		25.90		.74				
1532	Paso Robles	1890	26.95		.31				
1756	Paso Robles	1893	26.50		.24				
	Average, Cupertino	1891	**26.00**		**.69**				
	Average, Paso Robles	1892	**26.72**		**.28**				

*Fortified.

C. RAISIN AND TABLE GRAPES.

The table-grapes included in this group are, for the most part, well known in California already. Some, such as the Pizzutello and Gros Colman, are worthy of being better known, for they are very showy and attractive, though unfitted for distant shipments, on account of their delicate skin. With different methods of packing and more careful handling, they could be made very profitable for local markets. The grape of Almeria has doubtless a future, for, as the experiments show, it is possible in some localities, by appropriate methods of pruning and training, to make it produce good crops, and it has probably no superior as a keeping grape.

Some of the Spanish Sherry grapes, such as the Mantuo, Beba, Perruno, and Mourisco, are very promising as table-grapes, and are also worthy of trial for the production of raisins. In southern Spain and Portugal very good lye-dipped raisins are made from these varieties, and their heavy bearing and freedom from coulure recommend them in spite of the superior quality of the Muscat of Alexandria. The raisin-grapes are considered in this report principally from the side of their utility as wine producers, though the analyses throw some light on their relative values for drying purposes.

RAISIN-GRAPES.

MUSCAT OF ALEXANDRIA.

(See Vit. Rept. 1885–86, p. 108.)

Description.—Vine small and not very vigorous, spreading in habit; canes short-jointed and of medium size; leaves medium size, round, generally five-lobed, the upper sinuses well marked and closed, the lower shallow and sometimes wanting, the petiolar sinus open, glabrous on both sides, and sharply toothed; bunches large, winged, loose, sometimes branching; berries large, varying from nearly round to elliptical or obovoid, with thin but rather tough skin, firm, crisp flesh, and green to dull yellow color.

The synonymy of the Muscat is in a somewhat unsettled state. There is no doubt that there exist several forms in California which, by many observers, are classed together as Muscat of Alexandria. Whether these are simple variations due to climatic conditions and selection is impossible at present to say. The Gordo Blanco, which is held by many careful observers to be sufficiently distinct from the Muscat of Alexandria, is chiefly distinguished by the roundness of its berries. This seems hardly sufficient to base a variety on, in view of the fact that both obovoid and nearly round berries are found on the same bunch. The Huasco, which resembles the Gordo Blanco form in roundness of berries and the greater compactness of its bunches, seems also to differ in the

greater prevalence of three-lobed leaves. The presence of three or five lobed leaves is, however, a variable characteristic in the Muscat. Nearly all varieties which, like the Muscat, are of ancient origin and wide distribution, exhibit similar variations, due generally to careful selection of cuttings. Whether or not these various forms are to be considered as true varieties, they are economically of great importance, as by proper selection the quality of the raisins of California can be improved, and the unfortunate liability of the Muscat to coulure may be overcome. At the Experiment Stations the Huasco form has shown considerable superiority in the matter of freedom from coulure; but its round berries and more compact bunches render it somewhat less adapted to the production of "gilt edge" bunch raisins.

As a wine-grape the Muscat of Alexandria is little used, except to make a little sweet "Muscat wine," and occasionally in small quantities, to add aroma to neutral grapes. For the production of sweet Muscat wine it is much inferior to the small Muscatel or Frontignan, and for blending with other varieties it would be well replaced by that grape, by the Malmsey, or by some of the true Malvoisies, whose flavor is more delicate and more suitable to wine-making.

ANALYSES OF MUSTS AND WINES.

MUSCAT OF ALEXANDRIA.	Date of Picking	MUST.				WINE.					
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six to Eight Months.	Body	Ash	Sugar
1890—No. 1288.* Cupertino	Oct. 1	20.40	.....	.47	.14	.....	.....	.....	.....	.....	.....
No. 1345.* Mission San José	Oct. 11	25.63	.....	.51	.21	15.42†	18.98	.41	2.43	.....	4.27
No. 1407.* Cupertino	Oct. 21	24.25	.....	.58	.....	.....	.....	.....	.....	.....	.....
1891—No. 1456.* Fresno	Aug. 28	25.85	25.30	.41	.....	14.50†	17.90	.13	2.45	.....	.....
No. 1535.* Paso Robles	Oct. 3	24.90	.....	.40	.....	.....	.....	.....	.....	.....	.....
1892—No. 1696. Tulare	Sept. 27	26.00	.....	.46	.....	.....	.....	.....	.....	.....	.....
No. 1718. Tulare	Oct. 3	25.90	.....	.24	.....	.....	.....	.....	.....	.....	.....
No. 1719.* Tulare	Oct. 3	24.80	.....	.33	.....	.....	.....	.....	.....	.....	.....
No. 1731. Paso Robles	Oct. 11	25.65	.....	.36	.....	.....	.....	.....	.....	.....	.....
No. 1758.* Paso Robles	Oct. 11	24.25	.....	.33	.....	.....	.....	.....	.....	.....	.....
1893—No. 1972. Tulare	Oct. 14	24.80	24.43	.48	.....	.....	.....	.....	.....	.....	.....
No. 1974.* Tulare	Oct. 14	21.40	20.60	.39	.23	.....	.....	.....	.....	.....	.....
1894—No. 2239.* Mission San José	Oct. 5	21.10	.....	.50	.....	.....	.....	.....	.....	.....	.....

*Huasco. †Fortified.

RECORD OF TREATMENT.

No. 1288. *Huasco*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 3, 1890, in good condition, but not quite ripe. The bunches and berries were very large, and apparently the same as the spherical form of the Muscat of Alexandria. The must showed 20.4% of solid contents by spindle and 0.47% of acid.

No. 1345. *Huasco*, from Mission San José. Received October 14, 1890, in fair condition. The bunches were long and loose, but with a little coulure; the berries very large and fine. The must showed 25.63% of solid contents by spindle and 0.51% of acid. The temperature of the grapes at crushing was 69°, and the maximum was 76°, reached on the third day. On the fifth day, while the wine was still a little sweet, it was fortified.

At three months the wine was bright, of medium acid and sweetness, and strong Muscat aroma. At this date it was racked and put in the heating-chamber, at a temperature of 110°, for three months. At eight months it was bright, clean-tasting, and well developed. At this time it was racked for the third time. At sixteen months it was in good order, of strong and pleasing aroma, maturing well, and generally improved, but rather too sweet. It gradually improved, and at four years was a bright, clean-tasting, agreeable Muscat. At this date it was put in glass.

No. 1407. *Huasco*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 24, 1890, in good condition, and mature. The bunches were fairly well filled and the berries large. The must showed 24.25% of solid contents by spindle and 0.58% of acid.

No. 1456. *Huasco*, from Fresno. Received August 31, 1891, in good condition, and mature. The must showed 25.85% of solid contents by spindle and 0.41% of acid. The temperature of the grapes at crushing was 76°. The day after crushing the temperature had fallen to that of the room (73°), and reached its maximum of 77° on the third day. The must fermented slowly, and on the seventh day it was fortified while still sweet.

At four months the wine was bright, clean-tasting, and with delicate Muscat aroma and moderate sweetness. Two months later it was racked for the second time, and put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and ten months it was in good order, smooth and agreeable, but in too small a quantity to show its best qualities. Four months later it had improved, and was put in glass.

No. 1535. *Huasco*, from Paso Robles station. A sample for must analysis was received October 5, 1891, in good condition. The bunches were loose and of medium size; the berries were not very large and rather too ripe. The must showed 24.9% of solid contents by spindle and 0.40% of acid.

No. 1696. *Muscat of Alexandria*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 26.0% of solid contents by spindle and 0.46% of acid.

No. 1718. *Muscat of Alexandria*, from Tulare station. A sample for must analysis was received October 5, 1892, in good condition. The must showed 25.9% of solid contents by spindle and 0.24% of acid.

No. 1719. *Huasco*, from Tulare station. A sample for must analysis was received October 5, 1892, in good condition. The must showed 24.8% of solid contents by spindle and 0.33% of acid.

No. 1731. *Muscat of Alexandria*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 25.65% of solid contents by spindle and 0.36% of acid.

No. 1758. *Huasco*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 24.25% of solid contents by spindle and 0.33% of acid.

No. 1972. *Muscat of Alexandria*, from Tulare station. A sample for must analysis was received October 16, 1893, in good condition. The bunches were of medium size, loose, and irregular; the berries large. The must showed 24.8% of solid contents by spindle and 0.48% of acid.

No. 1974. *Huasco*, from Tulare station. A sample for must analysis was received October 16, 1893, in good condition. The grapes were larger than those of No. 1972, and the bunches showed less coulure. The must showed 21.4% of solid contents by spindle and 0.39% of acid.

THOMPSON'S SEEDLESS.

Synonyms: Sultanina; Sultanieh; Sultani.

Description.—Vine very vigorous, and with large trunk and very long canes; leaves glabrous on both sides, dark yellowish-green above and lighter below, generally three-lobed, with shallow sinuses, teeth short and obtuse; bunch large, conico-cylindrical, well filled, on herbaceous pedun-

cles; berries under medium, ellipsoidal, crisp, of neutral flavor, with moderately thick skin of a fine golden-yellow color.

This variety, which was distributed by Elwanger & Barry, New York, in 1872, as a Turkish variety under the name of Lady Decoverly, received the name it is most commonly known under from Mr. Thompson, of Yuba City, who first distributed it in California.

Judging from the complete description of the Sultanina given by J. M. Guillon (Revue de Viticulture, tome 3, p. 216, 1895) there can be little doubt that our California Thompson's Seedless is identical with it. It is from this grape that the Sultana grapes of Asia Minor are made. It is also grown to some extent in Greece for the same purpose. It bears plentifully, even with short-pruning, though in its native land it is pruned long.

The Sultanina is supposed by some authorities to be a simple cultural variation of the Sultana, but this is extremely improbable, for its distinctly elongated berries denote, in the absence of any intermediate forms, a different origin from the perfectly round berries of the Sultana.

ANALYSES OF MUSTS.

THOMPSON'S SEEDLESS.	Date of Picking.	Solid Contents by Spindle.	Acid as Tartaric.	Ash.
1890—No. 1376. Cupertino	Oct. 15	26.92	.45	.....
1892—No. 1636. Tulare	Sept. 4	24.45	.33	.....
1893—No. 1894. Tulare	Sept. 23	25.05	.37	.31

RECORD OF TREATMENT.

No. 1376. *Thompson's Seedless*, from Cupertino. A sample for must analysis was received October 17, 1890, in good condition. The bunches were irregular, winged, and loose, on slender, green peduncles; the berries oblong, of light golden color, on long pedicels; the skin was thick but tender, the flesh crisp, sweet, and agreeable. The must showed 26.92% of solid contents by spindle and 0.45% of acid.

No. 1636. *Thompson's Seedless*, from Tulare station. A sample for must analysis was received September 6, 1892, in good condition. The must showed 24.45% of solid contents by spindle and 0.33% of acid.

No. 1894. *Thompson's Seedless*, from Tulare station. A sample for must analysis was received September 25, 1893, in good condition. The bunches were of medium size, well filled, but not compressed; the berries under medium size, very irregular in shape, from nearly spherical to long ellipsoidal; peduncles and pedicels slender; flesh crisp and very sweet; color golden-yellow, with light bloom. The must showed 25.05% of solid contents by spindle and 0.37% of acid.

SULTANA.

(See Vit. Rept. 1885–86, p. 102.)

Synonym: Seedless Sultana.

Description.—Vine vigorous, upright; leaves large, five-lobed, with rather shallow sinuses, light colored, and coarsely toothed: bunches large, long-cylindrical, with heavy shoulders or wings, well filled when not coulured, but not compacted; berries small, round, firm and crisp, golden-yellow, and without seeds.

The Sultana is widely cultivated in California as a raisin and table

grape, though for the latter purpose it is being partially superseded by Thompson's Seedless. It does not correspond to any available description of European or Asiatic grapes. The Sultanina, from which the bulk of the seedless raisins of Smyrna is made, resembles much more closely the Thompson's Seedless than our California Seedless Sultana. As a raisin-grape the Sultana is too well known to need any description. It is for raisins, rather than for wine-making, that it will be found useful. Its wine is neutral and fairly agreeable, but never attains high quality and is not a very good keeper. Blended with other grapes it may be used in the production of sweet wines, but, in the coast counties especially, its acid is rather too high for this purpose. It is to this acidity that the superior piquancy which is claimed for its raisins over those of the Thompson's Seedless is doubtless due. The identity of this grape has not yet been established. It is probably the round-berry Kechmish to which Odart refers, and which he says enters into the composition of the wines of Schiraz.

ANALYSES OF MUSTS AND WINES.

SULTANA.	Date of Picking	MUST.				WINE.				
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric, at Six Months	Volatile Acid at Six Months	Body
1887—No. 774. Cupertino	Oct. 24	26.10	26.31	.41	.34	10.81	13.27	.47	.06	2.30
1888—No. 892. Cupertino	Oct. 8	22.97	23.13	.49	.27	10.63	13.09	.48	----	2.70
No. 893. Cupertino	Oct. 8	26.51	27.65	.39	.29					
1890—No. 1356. Mission San José	Oct. 13	26.60	------	.54	----	------	------	------	----	----
1891—No. 1483. Fresno	Sept. 9	22.11	21.22	.60	----	*15.50	19.08	.44	----	3.30
1892—No. 1711. Mission San José	Oct. 4	25.00	25.19	.62	.25	9.56	11.91	.61	----	2.70
No. 1715. Tulare	Oct. 3	21.20	------	.30	----	------	------	------	----	----
1893—No. 2066. Mission San José	Nov. 1	27.15	------	.60	----	------	------	------	----	----
1894—No. 2245. Mission San José	Oct. 3	26.00	------	.56	----	------	------	------	----	----

*Fortified.

RECORD OF TREATMENT.

No. 774. *Seedless Sultana*, from J. T. Doyle, Cupertino. Received October 25, 1887, in good condition. The bunches and berries were very uneven in size, and showed some coulure. Part of the grapes were from long-pruned and part from short-pruned vines. Those from long-pruned vines were the finest and showed the least coulure. The must showed 26.1% of solid contents by spindle and 0.41% of acid. The temperature of the grapes at crushing was 74°, and the maximum reached was 84°, on the second day. The fermentation was over on the eleventh day, when the wine was racked off.

At one month the wine was racked and taken to the cellar. A month later it was clear, sound, with low, pleasant acid, but little character. At four months it was racked for the third time, and at seven months it was bright, pleasant, and sound. At this date a microscopical examination of the lees showed no unsound ferments, and the wine was racked into glass. A month later the wine was in good condition and had developed a little bouquet.

Nos. 892 and 893. *Seedless Sultana*, from J. T. Doyle, Cupertino. Received October 9, 1888, in good condition. The numbers refer to samples from long-pruned and from short-pruned vines, respectively. Both samples showed a good deal of coulure, but the long-pruned was the most evenly ripened, though somewhat sunburned. The must showed 22.97% of solid contents by spindle and 0.49% of acid for the short-pruned, and

26.51% of solid contents by spindle and 0.39% of acid for the long-pruned. The must from both samples was fermented in one cask.

At seventeen days the wine was drawn off, and at one month it was racked and taken to the cellar. At three months it was clear, of good flavor, pleasant acid, and adequate alcohol. At five months it was racked again, and the lees examined and found to be sound. Tastings at ten and at fourteen months showed improvement and the development of some bouquet. At sixteen months it was bright and of good bouquet, but the after-taste was not quite clean. At this time the wine was racked and part put in bottle. At twenty-one months the lees were sound and the wine was bright, improved generally, clean-tasting, and with good flavor. A month later it was bottled. At twenty-eight months the wine bottled at sixteen months was clear, but had made some deposit in the bottle; that bottled at twenty-two months was bright, without deposit, and of good quality. At four years both wines were very good, but the second bottling was fresher-tasting and had a more pronounced bouquet.

No. 1356. *Sultana*, from Mission San José. A sample for must analysis was received October 14, 1890, in good condition. The bunches were large, winged, with medium-sized berries. The must showed 26.6% of solid contents by spindle and 0.54% of acid.

No. 1483. *Sultana*, from Egger's Vineyard, Fresno. Received September 11, 1891, in good condition. The must showed 22.11% of solid contents by spindle and 0.60% of acid. The temperature of the grapes at crushing was 70°, and the maximum, reached the sixth day, was 73°. The fermentation was very slow, and on the eleventh day the wine was fortified.

At four months the wine was bright, mild, and clean-tasting, of medium sweetness, and almost colorless. A month later it was racked for the second time, and at six months put in the heating-chamber, at a temperature of from 90° to 95°, for three months. At two years and ten months the wine was bright and in good order, but lacking in flavor, and vapid, without any real Sherry flavor. Four months later it had improved a little, but lacked character. It was put in glass, on account of the smallness of the quantity.

No. 1711. *Sultana*, from Mission San José. Received October 5, 1892, in fair condition. The must showed 25% of solid contents by spindle and 0.62% of acid. The temperature of the grapes at crushing was 69°, and the maximum, reached the third day, was 80°. On the eighth day the wine was dry, and was racked off.

At one month the wine was cloudy, but was quite dry. It was racked for the second time, and at three months it was bright, with little aroma, but pleasant flavor, medium acid, full body, and clean taste. At five months, when it was racked again, it was in good condition and had improved. At eight months it was in good order, but had not developed any bouquet. At ten months it showed a little bouquet. At fourteen months it was very good, and had kept remarkably well, considering the smallness of the quantity. A month later it was bottled.

No. 1715. *Sultana*, from Tulare. A sample for must analysis was received October 5, 1892, in good condition. The must showed 21.2% of solid contents by spindle and 0.30% of acid.

No. 2066. *Sultana*, from Mission San José. A sample for must analysis was received November 1, 1893, in good condition. The bunches were large, irregularly branching, and well filled; the berries from small to medium, and very sweet. The must showed 27.15% of solid contents by spindle and 0.60% of acid.

BLACK TABLE-GRAPES.

BLACK HAMBURG AND BLACK PRINCE.

(See Vit. Rept. 1885–86, p. 76.)

Synonyms: Trollinger; Frankenthaler.

Description.—Vine very vigorous, with thick, light-colored canes; leaves large, wider than long, not deeply cut, glabrous above and nearly so below, except for a considerable hairiness on the nerves; bunches large, short, winged, rather loose, on long peduncles; berries large to very large, generally round, and on long pedicels; flesh firm, crisp, juicy, and with little flavor, but agreeable to eat.

The Black Hamburg takes the place among red grapes occupied by Chasselas among the white. Its regularity of bearing, the ease with which it is cultivated, and the wide range of conditions under which it thrives as a table-grape, have caused it to be planted in small quantities over almost the whole of the vine-growing world. This wide distribution has led to the production of innumerable variations of the grape, and to a large and confusing synonymy. The Black Prince, which is now extensively cultivated in California as a table-grape for the home market, seems to be only one of the numerous variations of the Black Hamburg, valuable for its large bunches of fine, crisp, but rather flavorless berries. The few wines made from it show it to be little better for this purpose in California than the Black Hamburg. It attains, apparently, a higher percentage of sugar, but makes an equally characterless, vapid wine, of poor keeping qualities.

ANALYSES OF MUSTS AND WINES.

BLACK PRINCE.	Date of Picking.	MUST.				WINE.					
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol.		Tannin.	Total Acid as Tartaric.		Body.
						By Weight.	By Volume.		At Pressing.	At Six Months.	
1887—No. 781. Cupertino		24.70	24.64	.53	.44	10.35	12.82	.240	.45	.45	3.10
1890—No. 1265.* Cupertino	Sept. 28	15.87	----	.54	----	----	----	----	----	----	----
1892—No. 1699. Tulare	Sept. 28	24.10	----	.33	----	----	----	----	----	----	----
1893—No. 1956. Paso Robles	Oct. 13	25.20	24.12	.42	.38	9.49	11.82	.102	.42	.46	2.80
No. 2003. Tulare	Oct. 21	23.70	22.40	.32	.50	8.62	10.75	.071	.33	.43	2.50
1894—No. 2347. Tulare	Oct. 27	23.70	----	.18	----	----	----	----	----	----	----

*Black Hamburg.

RECORD OF TREATMENT.

No. 781. *Black Prince*, from J. T. Doyle, Cupertino. Received October 26, 1887, in good condition. The stems were green, but the grapes were fully ripe and a few were overripe. The berries were slightly oval, very large, soft, juicy, and thin-skinned. The must showed 24.7% of solid contents by spindle and 0.53 of acid. The grapes were crushed after arrival at a temperature of 70°. The maximum temperature, reached the third day, was 83°. The fermentation was very violent, and was finished on the fifth day.

At two months the wine was very pleasant, clean-tasting, and light-bodied. At four months it was racked for the second time; it was bright, clean-tasting, but thin and without special flavor. For three or four months it remained bright and of fair quality, but later it deteriorated and did not keep well.

No. 1699. *Black Prince*, from Tulare station. A sample for must analysis was received September 29, 1892, in good condition. The must showed 24.1% of solid contents by spindle and 0.33% of acid.

No. 1956. *Black Prince*, from Paso Robles station. Received October 15, 1893, in fair condition. The bunches were large and irregular, loose; the berries on some bunches were large, well formed, and well colored, on others abortive and dried up. The must showed 25.2% of solid contents by spindle and 0.42% of acid. The grapes at crushing showed 64°, and the maximum temperature, reached the third day, was 81°. On the fourth day the wine was dry, and on the fifth day it was drawn off.

At one month the wine was racked for the second time and taken to the cellar; it was almost clear, but contained a little sugar and was almost without color. At three months it was clear, but thin, flat, and of very poor quality. A month later it was racked again, but did not improve.

No. 2003. *Black Prince*, from Tulare station. Received October 23, 1893, in good condition. The bunches were large, conical, shouldered, well filled, but not compact; the berries large, oval, light colored, and very sweet. Some second-crop bunches mixed with the others were smaller, and had smaller and more deeply colored berries, which were less ripe than the first crop. The must showed 23.7% of solid contents by spindle and 0.32% of acid. The temperature of the grapes at crushing was 67°. The must fermented slowly, and was still a little sweet when drawn off on the fourth day. The wine was of poor quality, and soon deteriorated. At three months it was clear, but flat and worthless. It did not improve, and at six months was thrown away.

GROS COLMAN.

Synonyms: Dodrelabi; Ochsenauge; Eichkugeltraube.

Description.—Vine strong-growing, with dark brownish wood; leaves very large, round, thick, very slightly lobed, shortly and bluntly toothed, glabrous above, close-woolly below; bunches large, short, well filled, but not compact; berries very large, round, dark blue, with thick but tender skin.

The Dodrelabi is remarkable, as having the largest berries of any round-berry variety known. It is cultivated largely in eastern and central Europe, and is also a very great favorite in the hothouses of England and Belgium. It is probably the handsomest black table-grape grown; its large, round berries, which are not pressed out of shape by too great compactness of the bunches, are very attractive in appearance and very agreeable too eat. The grapes have good keeping qualities, except that they are very liable to crack. They are, on this account, difficult to ship to any great distance.

ANALYSES OF MUSTS.

GROS COLMAN.	Date of Picking.	Solid Contents by Spindle.	Acid as Tartaric.	Ash.
1890—No. 1269. Cupertino	Oct. 1	14.70	.57	.....
No. 1425. Mission San José	Oct. 29	21.95	.42	.....
1893—No. 1932. Paso Robles	Oct. 11	15.20	.40	.33
No. 1973. Tulare	Oct. 14	21.50	.41	.33

RECORD OF TREATMENT.

No. 1269. *Gros Colman*, from Cupertino. A sample for must analysis was received October 2, 1890, in fair condition, some of the berries being cracked and not quite ripe. The must showed 14.7% of solid contents by spindle and 0.57% of acid.

No. 1425. *Gros Colman*, from Mission San José. A sample for must analysis was received October 31, 1890, in poor condition. The grapes were mature and very fine-looking, but crushed and moldy. The must showed 21.95% of solid contents by spindle and 0.42% of acid.

No. 1932. *Gros Colman*, from Paso Robles. A sample for must analysis was received October 13, 1893, in fair condition. The grapes were very irregular in size and coloring; some bunches were well filled with large, well-colored berries, others were loose, with small, greenish, flavorless berries. The must showed 15.2% of solid contents by spindle and 0.40% of acid.

No. 1973. *Gros Colman*, from Tulare. A sample for must analysis was received October 16, 1893, in good condition. The bunches were of medium size, cylindrical, close; the berries very large, crisp, juicy, and tender-skinned, with little flavor and not very sweet, though some berries were commencing to dry up. The must showed 21.5% of solid contents by spindle and 0.41% of acid.

BLACK MOROCCO.

Description.— Vine a strong grower, with thin, spreading canes; leaves under medium size, very deeply five-lobed, even when very young, the younger leaves truncate at base, giving them a semi-circular outline, with long, sharp teeth alternating with very small ones, glabrous on both sides; bunches very large, short, shouldered, and compact; berries very large, round, often angular from compression, fleshy, of neutral flavor, dull purple color or colorless in the center of the bunch. This grape is remarkable for the number of second-crop bunches which it produces on the laterals.

The Black Morocco is late in ripening and of very fine appearance, a fairly good shipping-grape, but difficult to pack on account of the size and rigidity of the bunches. The grapes are of an agreeable crispness, but lacking in flavor.

RECORD OF TREATMENT.

No. 1351. *Black Morocco*, from Cupertino. A sample for must analysis was received October 13, 1890, in good condition, and mature. The must showed 16.7% of solid contents by spindle and 0.65% of acid.

No. 2024. *Black Morocco*, from Tulare station. A sample for must analysis was received October 26, 1893, in good condition. The bunches were of medium size, short cylindrical, and compact; the berries very large and fairly well colored. The must showed 20.2% of solid contents by spindle and 0.45% of acid.

CALIFORNIA BLACK MALVOISIE.

(See Vit. Rept. 1887–89, p. 212.)

This variety, which has been afflicted with more inappropriate and misleading synonyms than fall to the lot of most grapes, even in California, resembles the Cinsaut in its berries and in the form of its leaves; but the bunches are much more loose and lack the peculiar aroma of the Cinsaut, and the leaves are much larger and the vine of stronger and longer growth. Its wine matures quickly, and is pleasant to the taste at six to eight months, but does not improve with age, and is a poor keeper. It is certainly utterly different from any variety of the Malvoisie type, but the name given above has become so closely identified with it that it is perhaps best to retain it. This variety has been generally abandoned, except as a table-grape for local markets.

ANALYSES OF MUSTS.

CALIFORNIA BLACK MALVOISIE.		Date of Picking.	MUST. Solid Contents by Spindle.	MUST. Acid as Tartaric.
1891—No. 1478.	Paso Robles	Sept. 1	22.80	.55
1893—No. 1855.	Amador station	Sept. 12	20.20	.60
1894—No. 2194.	Amador station	Sept. 25	23.40	.59
No. 2224.	Amador station	Oct. 3	27.60	.43

RECORD OF TREATMENT.

No. 1478. *California Malvoisie*, from Paso Robles station. A sample for must analysis was received September 3, 1891, in good condition, and riper than the Cinsaut from the same place. The must showed 22.8% of solid contents by spindle and 0.55% of acid.

No. 1855. *California Malvoisie*, from Amador station. A sample for must analysis was received September 15, 1893, in good condition. The bunches were of good size, well filled, but not compact; the berries large and not quite mature; there was no sign of coulure. The must showed 20.2% of solid contents by spindle and 0.60% of acid.

CORNICHON.

Synonyms: Cornichon Violet; Eicheltraube.

Description.—Vine a heavy grower, with thick, light brown, short-jointed wood; leaves large, longer than wide, deeply five-lobed, dark green above, and lighter and very hairy below, coarsely toothed, and with short, thick petiole; bunches very large, loose, on long peduncles; berries large, long, more or less curved, darkly colored and spotted, thick-skinned, and on long pedicels.

This variety has been grown as a table-grape with great success in California, and is desirable on account of its attractive appearance, curious shape, excellent shipping qualities, and late ripening. On account of the length of its stalks and the looseness of its bunches, it is very easy to pack, even when the bunches are very large. The grapes grown at

Tulare under this name seem to differ considerably from the typical Cornichon as it is found in the more northern counties. It has more symmetrical berries and lighter color.

RECORD OF TREATMENT.

No. 1350. *Purple Cornichon*, from Cupertino. Received October 13, 1890, in good condition. A sample for must analysis was all that was received. The grapes were mature, and showed 17.2% of solid contents by spindle and 0.68% of acid.

No. 2007. *Purple Cornichon*, from Tulare station. A sample for must analysis was received October 23, 1893, in good condition. The bunches were small, irregular, loose; the berries large, long-elliptical, symmetrical, varying in color from brownish-pink to purple, fleshy, and thick-skinned. The must showed 19.3% of solid contents by spindle and 0.50% of acid.

EMPEROR.

Description.—Vine a strong, vigorous grower; leaves very large, with five shallow lobes, short, obtuse teeth, glabrous above, woolly beneath, light green in color; bunches very large, long, conical, loose, with large, dull purple, oval, firm berries.

This is an excellent shipping-grape of fine appearance, but of little flavor, and thick-skinned. When grown in a suitable location, and when properly trained, it is an immense bearer, and very satisfactory as a late shipping-grape. The vine must be allowed to extend itself; the vine and its arms should reach for seven or eight feet at least and should be short-pruned. When it is cut back to a mere stump the grapes do not set well.

RECORD OF TREATMENT.

No. 1349. *Emperor*, from Cupertino. A sample for must analysis was received October 13, 1890, in good condition, and mature. The must showed 19.3% of solid contents by spindle and 0.66% of acid.

No. 2236. *Emperor*, from Mission San José. A sample for must analysis was received October 4, 1894, in good condition. The bunches were large, loose, with little coulure; berries large, hard, and without flavor. The must showed 15.4% of solid contents by spindle and 0.72% of acid.

RED TABLE-GRAPES.

BARBAROSSA.

Synonyms: Barbarossa del Piedmonte; Uva Regina.

Description.—Vine prolific and of medium vigor; leaves small, deeply five-lobed, with closed sinuses, glabrous on both sides except for some short, stiff hairs on the under side; bunches large, very much winged, well filled; berries over medium size, round, crisp, juicy, and of agreeable but neutral flavor, skin tender and of a bright rose color.

This variety is cultivated to a large extent in Piedmont as a late table-grape, and to a less extent as a wine-grape. There are several distinct varieties, which go under the name of Barbarossa in Italy, but the one described above, which is the one at the Experiment Stations, is the most esteemed. At Mission San José and at Cupertino it has shown itself a fair bearer and a very agreeable and showy table-grape. It is, however, too delicate for general shipping purposes in California. At Tulare it has borne well, but failed to color. As a wine-grape the results have not been promising. Alone, it makes a thin, neutral wine. However, as it attains uniformly a good percentage of sugar with adequate acid, it might be used as a blend with a variety of more character. It can at present be recommended only as a showy table-grape for home use and for keeping during the winter months. The vine bears well with short-pruning, and requires a fairly rich soil in a warm, dry location. On irrigated or over-rich soils it fails to color.

ANALYSES OF MUSTS AND WINES.

BARBAROSSA.	Date of Picking.	MUST.				WINE.				
		Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.	Alcohol.		Total Acid as Tartaric, at Six Months.	Volatile Acid, at Six Months.	Body.
						By Weight.	By Volume.			
1887—No. 746. Cupertino	Oct. 16	24.60	23.61	.47	.42	10.16	12.64	.52	.07	2.60
1890—No. 1266. Cupertino	Sept. 29	22.90	.....	.58	.27	.....	.....	.....	.....	.....
No. 1429. Mission San José	Oct. 28	28.50	.....	.44	...	.....	.....	.....	.....	.....
1892—No. 1740. Paso Robles.	Oct. 10	24.80	.....	.37	...	.....	.....	.....	.....	.....
No. 1775. Mission San José	Oct. 13	22.85	23.13	.59	...	9.34	11.64	.65	....	2.44
1893—No. 1980. Tulare	Oct. 17	21.50	20.69	.47	.30	8.20	10.25	.45	....	2.80
No. 1995. Mission San José	Oct. 19	24.80	.....	.52	....	.....	.....	.....	.....	.....
No. 2088. Cupertino	Nov. 4	24.80	.....	.77	....	.....	.....	.....	.....	.....
1894—No. 2230. Mission San José	Oct. 3	22.80	.....	.48	....	.....	.....	.....	.....	.....

RECORD OF TREATMENT.

No. 746. *Barbarossa*, from J. T. Doyle, Cupertino. Received October 18, 1887, in excellent condition. The bunches were very large and short; the berries very large, sweet, and with little acid or flavor. The must showed 24.6 % of solid contents by spindle and 0.47% of acid. The temperature of the grapes at crushing was 80°, and the maximum, reached the following day, was 86°. The wine was drawn off the thick lees on the tenth day.

At two months the wine was bright, of fair aroma, adequate and pleasant acid, good body—a sound but neutral wine. A month later it was racked again and pasteurized for safety. At eight months it was bright, but quite neutral and somewhat flat.

No. 1266. *Barbarossa*, from J. T. Doyle, Cupertino. A sample for must analysis was received October 2, 1890, in good condition, and mature. The bunches were large, pyramidal, and close; the berries varying from large to very small; skin thick but tender; color light garnet, except those in the middle of the bunch, which were green; pulp crisp, juicy, sweet, with neutral flavor; peduncles thick and strong. The must showed 22.9% of solid contents by spindle and 0.58% of acid.

No. 1429. *Barbarossa*, from Mission San José. A sample for must analysis was received October 30, 1890, in fair condition, and mature. The must showed 28.5% of solid contents by spindle and 0.44% of acid.

No. 1740. *Barbarossa*, from Paso Robles station. A sample for must analysis was received October 13, 1892, in good condition. The must showed 24.8% of solid contents by spindle and 0.37% of acid.

No. 1775. *Barbarossa*, from Mission San José. Received October 15, 1892, in good condition. The must showed 22.85% of solid contents by spindle and 0.59% of acid. The temperature of the must at crushing was 62°, and the maximum, reached the fourth day, was 80°. On the ninth day the wine was racked off the thick lees.

At one month the wine was quite clear. At this date it was racked for the second time and taken to the cellar. At three months it was bright, without aroma, but with some flavor, of medium acid, and good body; a clean-tasting, neutral wine. Two months later it was racked again; it was in good order and was very pleasing, but of perfectly neutral character. Tastings at eight, ten, and fourteen months showed that the wine remained in good order; it was of pleasing character, but neutral and quite lacking in bouquet. At seventeen months it was bottled.

No. 1980. *Barbarossa*, from Tulare station. Received October 18, 1893, in good condition. The bunches were large to medium, winged, and close; the berries large, round, soft, and juicy, most of them green in color, but some pinkish and the second-crop bunches rose-colored. The must showed 21.5% of solid contents by spindle and 0.47% of acid. The temperature of the grapes at crushing was 63°, and the maximum, reached the third day, was 78°. The wine was dry on the fifth day, when it was racked off.

In three weeks the wine was clear, but rather flat and insipid. A month later it had improved somewhat, but showed little character. At this time it was racked and taken to the cellar. At three months it was clear, a fair, neutral wine, with little flavor or aroma. A month later it was racked again, and at six months it was in good order, sound but somewhat characterless. At ten months it had suffered a little from the smallness of the keg; it was mature, and was bottled.

No. 1995. *Barbarossa*, from Mission San José. A sample for must analysis was received October 19, 1893, in good condition. The bunches were large, conico-cylindrical, winged or shouldered, rather close; the berries a little over medium size, slightly ob-compressed when free, fleshy and fairly resistant, of a deep rose color, sweet and pleasant to eat. The must showed 24.8% of solid contents by spindle and 0.52% of acid.

No. 2088. *Barbarossa*, from J. T. Doyle, Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were of medium size, irregular, branching, a little coulured; the berries of unequal size, round, crisp, and with full acid. The must showed 24.8% of solid contents by spindle and 0.77% of acid.

FLAME TOKAY.

Synonyms: Flaming Tokay; Uva de Ragol.

Description.—Vine a strong grower; leaves of medium size, light yellowish-green in color, slightly lobed, long-toothed, glabrous on both sides; bunches large, close, conico-cylindrical, on thick peduncles; berries large, longer than wide, flattened at the ends, fleshy, crisp, flesh-colored where exposed to the light, green when too much shaded.

This variety, which has been grown so extensively in California as a shipping-grape, is the "Uva de Ragol" or "Culo de Horza," which is grown largely in Sevilla, and where it is very highly valued as a good-keeping grape, a reputation which it sustains equally in California. It is most successful on a clayey soil; on sandy and alkali soils it bears well, but fails to color its berries well. The vine has been supposed to be able to resist the phylloxera. It resists, however, only in a manner

similar to several other European varieties; that is to say, when it is in a particularly favorable soil it will continue to live for many years after its roots are thoroughly invaded by the insect, and after other varieties in the same ground are dead. It is not properly a resistant, for it is so injured and weakened by the attacks of the parasite that it is worthless either for direct bearing or grafting.

RECORD OF TREATMENT.

No. 1928. *Flame Tokay*, from Natoma. A sample for must analysis was received October 12, 1893, in good condition. The must showed 19.5% of solid contents by spindle and 0.36% of acid.

WHITE TABLE-GRAPES.

LUGLIENGA.

Synonyms: Lignanga; Lignan blanc; Gelbe Seidentraube.

The wide range of this grape is indicated by the host of synonyms under which it labors, and of which the above are but a few of the commoner.

Description.—Vine strong-growing, and sensitive to frost; leaves of medium size, deeply five-lobed, dark green, glabrous on both sides, sharply toothed, the terminal tooth of each lobe very long and acuminate; bunches of medium size, well filled; berries of medium size, oval, at first green, becoming yellow with overripeness, with thin skin, crisp, firm flesh, and agreeable flavor.

The Luglienga, the name of which means July grape, is one of the earliest grapes known. This, in connection with its good quality as an eating-grape, and the length of time which it will keep, has made it a favorite grape for home use nearly all over Italy and in many parts of France, Austria, and Germany. It is said that one vine of this variety will often suffice to supply a whole family with grapes from the beginning to the end of the grape season. It is on account of this fact that it is called in Piedmont "Bona in Ca," meaning "good to grow on the house."

The name of "Seidentraube" (silk grape) comes from the peculiar soft feeling which the grape has when being eaten, and which is one of its chief merits. The vine is unsuited to head-pruning, and seldom produces more than half a crop, on account of its liability to coulure unless allowed to extend itself. This grape would be excellent for home markets, and much superior to the early Sweetwaters, which usually appear in the market first. It is rather too thin-skinned for long shipments, but if handled carefully will keep a long time.

RECORD OF TREATMENT.

No. 1210.* *Luglienga*, from Fresno. A sample for must analysis was received August 25, 1890, in fair condition. The grapes were quite ripe, and showed 20.85% of solid contents by spindle and 0.32% of acid.

No. 1214. *Luglienga*, from Fresno. A sample for must analysis was received August 25, 1890, in fair condition. The grapes were overripe, and showed 20.85% of solid contents by spindle and 0.33% of acid.

*Imported under name of Gelbe Seidentraube.

No. 1305.* *Luglienga*, from Cupertino. A sample for must analysis was received October 8, 1890, in good condition, but overripe and commencing to shrivel. The must showed 24.25% of solid contents by spindle and 0.34% of acid.

No. 1441. *Luglienga*, from Tulare station. A sample for must analysis was received August 29, 1891, in good condition. The must showed 23.7% of solid contents by spindle and 0.36% of acid.

No. 1812. *Luglienga*, from Amador station. A sample for must analysis was received September 1, 1893, in good condition. The must showed 21.1% of solid contents by spindle and 0.47% of acid.

No. 2087. *Luglienga*, from Cupertino. A sample for must analysis was received November 6, 1893, in good condition. The bunches were of medium size, long-conical, winged, well filled; berries under medium size, oval, very sweet, and overripe, but still firm and of very agreeable flavor. The must showed 28.0% of solid contents by spindle and 0.35% of acid.

PIZZUTELLO DI ROMA.

Synonyms: Weisse Eicheltraube; Cornichon blanc; Santa Paula.

Description.—Leaves five-lobed not deeply cut, together with the young shoots glabrous on both sides; bunches large, long, loose; berries long and thin, generally curved, crisp, thin-skinned.

The synonomy given above is perhaps a little doubtful, and may include two varieties similar in fruit but differing in leaf characters. The one described is the favorite table-grape grown in the outskirts of Rome. It is of very attractive appearance and agreeable crispness, but almost totally lacking in flavor. Its remarkably thin and tender skin increases its desirability as an eating-grape, but militates very much against its shipping qualities. It is much inferior in this respect to the Black Cornichon, which it resembles in shape and flavor.

Record of Treatment.

No. 2006. *Pizzutello di Roma*, from Tulare. A sample for must analysis was received October 23, 1893, in good condition. The bunches were of medium size, short-cylindrical, loose, on slender peduncles; the berries large, long, generally curved, hard, flavorless, on thick pedicels. The must showed 22.2% of solid contents by spindle and 0.38% of acid.

ALMERIA.

Description.—Vine vigorous; leaves of medium size, round, and slightly or not at all lobed, quite glabrous on both sides, teeth obtuse and alternately large and small; bunches large, loose or compact, irregularly conical; berries from small to large, cylindrical, flattened on the ends, very hard and tasteless.

The grape cultivated at the Experiment Stations under this name is one of the several varieties which are shipped in such large quantities from Malaga and Almeria packed in sand or cork-dust. The chief of these varieties are the De Loxa, Ataubi, and Ciuti, all white grapes of similar character, having the common properties of late ripening, hard, crisp flesh, and firm attachment to the pedicel. Which of these varieties we have under the name of Almeria has not yet been determined. The above description is drawn up from the vines growing at the Tulare station.

The grapes ripen late and attain about 20.0% of sugar. They have remarkable keeping qualities and resist mold, fermentation, and drying-up better than any grape which we have tried. Some berries, detached

*Imported under name of Gelbe Seidentraube.

from the bunch and placed loose in a box, remained perfectly good and with very little shriveling for over four months. The difficulty which has been experienced in causing this variety to bear has been, in the cooler localities, due to the lack of sufficient heat, but in the hot interior valleys to an unsuitable method of pruning. An instance was brought to our notice by Mr. A. D. Shepard, which illustrates this fact. A vineyardist in the San Joaquin Valley, becoming disgusted with a patch of these vines which he had been cultivating for years without obtaining any grapes, allowed the vines to grow without any care, not even pruning them. The next season he obtained a large crop.

At Tulare the vines being allowed to extend themselves have given good crops. The vine should therefore be trained on trellis or wires, allowed to spread over a good deal of ground, and should only be planted in the hotter localities.

Record of Treatment.

No. 2023. *Almeria*, from Tulare station. Received October 26, 1893, in good condition. The bunches were large, loose to compact, irregularly conical; berries from small to large, cylindrical, flattened on the ends, very hard and tasteless. The must showed 19.7% of solid contents by spindle and 0.54% of acid.

AMERICAN TYPE.

HERBEMONT.

Description.—Vine a vigorous grower, with slender, short-jointed canes; leaves of medium size, with five strongly marked lobes, yellowish-green and glabrous above, very rough and hairy below; bunches of medium size to large, well shouldered, compact; berries small, round, juicy, with little foxiness.

ANALYSES OF MUSTS AND WINES.

HERBEMONT.	Date of Picking	MUST.			WINE.					
		Solid Contents by Spindle	Acid as Tartaric	Ash	Alcohol. By Weight.	Alcohol. By Volume.	Acid at Pressing	Acid at Six Months	Tannin	Body
1890—No. 1386. Cupertino	Oct. 19	22.40	.69							
1892—No. 1749. Paso Robles	Oct. 11	23.70	.56							
No. 1767. Mission San José	Oct. 16	21.30	1.05		8.48	10.58	.96	.73	.222	2.95
1893—No. 2001. Tulare	Oct. 21	20.20	.76	.37	7.43	9.27	.75	.52	.134	3.00
No. 2125. Cupertino	Nov. 3	24.40	.85				.90		.163	

RECORD OF TREATMENT.

No. 1386. *Herbemont*, from Cupertino. A sample for must analysis was received October 21, 1890, in good condition, and ripe. The must showed 22.4% of solid contents by spindle and 0.69% of acid.

No. 1749. *Herbemont*, from Paso Robles. A sample for must analysis was received October 13, 1892, in good condition. The grapes were very small, and showed 23.7% of solid contents by spindle and 0.56% of acid.

No. 1767. *Herbemont*, from Mission San José. Received October 18, 1892, in good condition. The must showed 21.3% of solid contents by spindle and 1.05% of acid. The temperature of the grapes at crushing was 58°, and the maximum, reached the fourth day, was 87°. On the fifth day the wine was dry, and was drawn off.

The wine was blended with a small quantity of Petit Bouschet, but unfortunately the record of the exact amount was lost. At two months the wine was clear, dry, and of deep color. At three months it was racked for the second time; it was bright, sound, and with full acid, not delicate, but with little foxiness. Two months later it was equally good; it was a good, sound wine, but not of agreeable aroma. At this date it was racked again. At eight months it showed advanced development and had improved. At fourteen months it had retained its good qualities, but was still rather rough. Four months later it was put in bottle.

No. 2001. *Herbemont*, from Tulare. Received October 23, 1893, in good condition. The bunches were small, irregularly conical, close; the berries small, nearly round, with very little foxiness, not well colored. The must showed 20.2% of solid contents by spindle and 0.76% of acid. The temperature of the grapes at crushing was 68°, and the maximum, reached the third day, was 94°. On the fourth day the wine was dry, and was racked off.

At one month the wine was clear, and was racked off and taken to the cellar. At four months it was racked again; it was clear, very light in color, clean-tasting, and of good acid, but not of good aroma. At this date it was racked for the second time. After this the wine deteriorated, and at ten months was flat and poor; the lees showed unsound germs. At sixteen months it was a flat, tasteless wine, without color or other good quality.

No. 2125. *Herbemont*, from Cupertino. A sample for must analysis was received November 5, 1893, in good condition. The bunches were of medium size, conical, winged, close; the berries under medium size, crisp, somewhat pulpy, sweet, with good acid and little foxiness. The must showed 24.4% of solid contents by spindle and 0.85% of acid.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing	WINE. Total Acid as Tartaric. At 6 to 8 Months	WINE. Body
	RAISIN GRAPES.										
	Muscat of Alexandria.										
1288	Cupertino	1890	20.40		.47	.14					
1407	Cupertino	1890	24.25		.58						
1345	Mission San José	1890	25.63		.51	.21	*18.98			.41	2.43
2239	Mission San José	1894	21.10		.50						
1456	Fresno	1891	25.85	25.30	.41		17.90			.13	2.45
1535	Paso Robles	1891	24.90		.40						
1731	Paso Robles	1892	25.65		.36						
1758	Paso Robles	1892	24.25		.33						
1696	Tulare	1892	26.00		.46						
1718	Tulare	1892	25.90		.24						
1719	Tulare	1892	24.80		.33						
1972	Tulare	1893	24.80	24.43	.48						
1974	Tulare	1893	21.40	20.60	.39	.23					
	Average, Cupertino		**22.33**		**.53**	**.14**					
	Average, Mission San Jose		**23.37**		**.50**	**.21**					
	Average, Paso Robles		**24.93**		**.36**						
	Average, Tulare		**24.58**	**22.52**	**.38**	**.23**					
	Sultana.										
774	Cupertino	1887	26.10	26.31	.41	.34	13.27			.47	2.30
892	Cupertino	1888	22.97	23.13	.49	.27	13.09			.48	2.70
893	Cupertino	1888	26.51	27.65	.39	.29					
1356	Mission San José	1890	26.60		.54						
1711	Mission San José	1892	25.00	25.19	.62	.25	11 91			.61	2.70
2066	Mission San José	1893	27.15		.60						
2245	Mission San José	1894	26.00		.56						
1483	Fresno	1891	22.11	21.22	.60		*19.08			.44	*3.30

*Fortified.

SUMMARY OF ANALYSES OF MUSTS AND WINES OF RAISIN, TABLE, AND OTHER GRAPES—Continued.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	MUST. Sugar by Copper Test	MUST. Acid as Tartaric	MUST. Ash	WINE. Alcohol by Volume	WINE. Tannin	WINE. Total Acid as Tartaric. At Pressing.	WINE. Total Acid as Tartaric. At 6 to 8 Months.	WINE. Body
	Sultana—Continued.										
1715	Tulare	1892	21.20		.30						
	Average, Cupertino		**25.19**	**25.69**	**.43**	**.30**	**13.18**			**.47**	**2.50**
	Average, Mission San Jose		**26.18**	**25.19**	**.45**	**.25**	**11.91**			**.61**	**2.70**
	Thompson's Seedless.										
1376	Cupertino	1890	26.92		.45						
1636	Tulare	1892	24.45		.33						
1894	Tulare	1893	25.05		.37	.31					
	Average, Tulare		**24.75**		**.35**	**.31**					
	BLACK TABLE-GRAPES.										
	Black Hamburg and Black Prince.										
781	Cupertino		21.70	24.64	.53	.41	12.82	.240	.45	.45	3.10
1265	Cupertino		15.87		.54						
1699	Tulare	1887	24.10		.33						
2003	Tulare	1890	23.70	22.40	.32	.50	10.75	.071	.33	.43	2.50
2347	Tulare	1892	23.70		.18						
1956	Paso Robles	1893	25.20	24.12	.42	.38	11.82	.102	.42	.46	2.80
	Average, Cupertino	1894	**20.28**	**24.64**	**.53**	**.44**	**12.82**	**.240**	**.45**	**.45**	**3.10**
	Average, Tulare	1893	**23.83**	**22.40**	**.28**	**.50**	**10.75**	**.071**	**.33**	**.43**	**2.50**
	Gros Colman.										
1269	Cupertino	1890	14.70		.57						
1425	Mission San José	1890	21.95		.42						
1932	Paso Robles	1893	15.20		.40	.33					
1973	Tulare	1893	21.50		.41	.33					

	Black Morocco.										
1351	Cupertino	1890	16.70		.65						
2024	Tulare	1893	20.20		.45						
	California Black Malvoisie.										
1478	Paso Robles	1891	22.80		.55						
1855	Amador station	1893	20.20		.60						
2194	Amador station	1894	23.40		.59						
2224	Amador station	1894	27.60		.43						
	Average, Amador station		**25.60**		**.54**						
	Cornichon.										
1350	Cupertino	1890	17.20		.68						
2007	Tulare	1893	19.30		.50						
	Emperor.										
1349	Cupertino	1890	19.30		.66						
2236	Mission San José	1894	15.40		.72						
	RED TABLE-GRAPES.										
	Barbarossa.										
746	Cupertino		24.60	23.61	.47	.42	12.64			.52	2.60
1266	Cupertino	1887	22.90		.58	.27					
2088	Cupertino	1890	24.80		.77						
1429	Mission San José	1893	28.60		.44						
1775	Mission San José	1890	22.85	23.13	.59		11.64			.65	2.44
1995	Mission San José	1892	24.80		.52						
2230	Mission San José	1893	22.80		.48						
1740	Paso Robles	1894	24.80		.37						
1980	Tulare	1892	21.50	20.69	.47	.30	10.25			.45	2.80
	Average, Cupertino	1893	**24.10**	**23.61**	**.61**	**.35**	**12.64**			**.52**	**2.60**
	Average, Mission San Jose		**26.38**	**23.13**	**.53**		**11.64**			**.65**	**2.44**
	Flame Tokay.										
1928	Natoma	1893	19.50		.36						
	WHITE TABLE-GRAPES.										
	Luglienga.										
1210	Fresno	1890	20.85		.32						
1214	Fresno	1890	20.85		.33						
1305	Cupertino	1890	24.25		.34						

SUMMARY OF ANALYSES OF MUSTS AND WINES OF RAISIN, TABLE, AND OTHER GRAPES—Continued.

Number	LOCALITY.	Vintage of	MUST. Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	WINE. Alcohol by Volume	Tannin	Total Acid as Tartaric. At Pressing	Total Acid as Tartaric. At 6 to 8 Months	Body
	Luglienga—Continued.										
2087	Cupertino	1893	28.00		.35						
1441	Tulare	1891	23.70		.36						
1812	Amador station	1893	21.10		.47						
	Average, Fresno		**20.85**		**.33**						
	Average, Cupertino		**22.13**		**.34**						
	Pizzutello di Roma.										
2006	Tulare	1893	22.20		.38						
	Almeria.										
2023	Tulare	1893	19.70		.54						
	AMERICAN TYPE.										
	Herbemont.										
1386	Cupertino	1890	22.40		.69						
2125	Cupertino	1893	24.40		.85			.163	.90		
1749	Paso Robles	1892	23.70		.56						
1767	Mission San José	1892	24.30		1.05						
2001	Tulare	1893	20.20		.76	.37	9.27	.134	.75	.52	3.00
	Average, Cupertino		**23.40**		**.60**			**.163**	**.90**		

NOTES ON RECENTLY IMPORTED GRAPES.

Of the most recently imported grapes in the collection obtained from Count S. di Rovasenda, of Turin, some varieties have commenced to bear at the Pomona and Tulare stations. At present but a partial report can be made on the character of their fruit and their adaptability to conditions existing in California; but the following notes are given for the benefit of those who have received cuttings of these varieties. They are principally Italian grapes, many from northern Italy (whence we have already obtained some of our most promising varieties), but others from Sicily, Sardinia, and southern Italy—localities whose grapes are as yet quite untried in California.

All the varieties have grown vigorously at Berkeley, where, however, they have all failed to mature any fruit. Their unsuitableness to cool localities is well illustrated in Berkeley by their failure to ripen perfectly their wood side by side with French varieties, nearly all of which mature their canes without difficulty.

Pelaverga (syn., Cari).—Robust and productive; bunches large; berries large, reddish-black, very sweet, and keeping well through the winter. Used for the production of a sweet, sparkling wine in the country around Saluzzo, but more suitable for a table-grape than for wine.

Zinzillosa (syn., Tintorina).—Resembles the Mourastel.

Bolgnino (syn., Nebbiolo di Dronero).—Cultivated near Saluzzo, in Piedmont, and differing very much from the true Nebbiolo. This variety has fruited at Tulare, and a sample of the grapes was received from there on October 14, 1895, in good condition. The must showed 24.6% of solid contents by spindle and 0.48% of acid. The bunches were small, compact, cylindrical, on heavy peduncles; the berries small, round, juicy, sweet, and of good flavor. A few of the grapes were sun-dried, and in general they resembled a Pinot.

Crovattina (syn., Croattina, Nebbiolo di Gattinara).—Grown in various parts of Piedmont and Lombardy. It has large, round, black berries, resembles the Bonarda more than the Nebbiolo, and gives a common wine of good color. It is a heavy bearer, but needs a deep soil.

Negrara di Gattinara.—A black wine-grape, cultivated in the extreme north of Piedmont.

Erbalus di Caluso.—It is from this grape that the liqueur wines of Caluso are made. On account of its thick skin and firm pulp it is a good keeper and very suitable to partial drying before crushing, as is done in making the liqueur wines of Caluso. It is not a heavy bearer, and requires long-pruning.

Description: Leaves of medium size, thin and smooth, dark green and slightly tomentose on the lower surface, sharply toothed, and deeply five-lobed; bunches cylindrical and with small wings; berries of medium size, round, thick-skinned, yellowish at first, becoming rose-colored.

This variety has fruited at the Pomona station, and on September 14, 1895, a sample of the grapes was received in good condition. The must showed 23.0% of solid contents by spindle and 0.62% of acid. The bunches were of medium size, cylindrical, well filled, on slender peduncles; the berries of medium size, nearly round, pulpy but soft, thick-skinned, from green to pink in color, on short, slender pedicels, not of very agreeable flavor, but mature and having good acid.

Grisa di Piemonte.—A valued table-grape of northern Italy. The bunches are large, conical, and well filled; the berries large, slightly oval, pulpy but soft, black, but grayish in appearance on account of their abundant bloom.

Antibo.—A large, black table-grape of Saluzzo, Piedmont. The grapes are said to be very crisp and agreeable.

Quagliano.—A large, black table-grape grown in the neighborhood of Cuneo, Piedmont, in light soils. It is of very delicate and agreeable flavor. A sample of the fruit of this variety was received from the Tulare station on October 14, 1895, in good condition. The must showed 23.9% of solid contents by spindle and 0.38% of acid. The bunches were of medium size, conical, and well filled; the berries large, round, crisp, rather astringent, of good flavor, and with tender skin. It was a very pleasing and fine looking table-grape, but not firmly enough attached to the pedicel for distant shipment. It resembled the Gros Colman.

Bermestia Rossa or Violetta.—A large table-grape cultivated in Lombardy and other parts of northern Italy. The bunches are large, loose, long, conico-cylindrical, on long, slender peduncles; the berries very large, long-olive-shaped, on long, slender pedicels; the skin is thick, violet-red; the flesh firm and of neutral flavor.

Bitondo.—A grape grown on the Adriatic side of central Italy. The grapes are large, round, of brick-red color; the bunches on long peduncles with distinct wings.

Malvasia Rovasenda.—A seedling originated by Baron Mendola, of Favara, Sicily.

Malvasia di Broglio.—Grown in Tuscany and Apulia, and in many other parts of Italy. It is a vigorous grower and good bearer, and resists the *oidium* well. A sample of the grapes was received on September 27, 1895, in good condition. The must showed 25.9% of solid contents by spindle and 0.45% of acid. The bunches were large, irregular, with many long cylindrical branches, well filled; the berries were small, round, firm, fleshy, with little flavor, resembling the Sherry grapes in character.

Negro Amaro (syn., Lacrima).—A wine variety of Apulia; said to be too late for northern Italy. A sample was received from Tulare in good condition. The must showed 25.9% of solid contents by spindle and 0.65% of acid. The bunches were of medium size, conico-cylindrical, compact, on heavy peduncles; the berries of medium size, slightly oblong, firm, juicy, thick-skinned, with fair color, of fresh and agreeable flavor. The grapes resemble the Chauché noir, but have better color and more flavor.

Cesanese.—A vine of central Italy, with black, oval grapes.

Trivoti.—A vine cultivated in Sicily. The grapes are large, ellipsoidal, light violet or marked with reddish-brown blotches.

Negro Dolce.—A vine cultivated in Apulia.

Catarrattu a la Porta.—A white grape of Sicily, which enters into the manufacture of the wines of Marsala. It has large, round, yellow berries, and bears well.

Mammolo Toscano.—Said to give a wine having a faint flavor of violets. It is cultivated in Tuscany, and is rather too late for more northern localities. The grapes are oval and black.

Pagadebito.—This name, which means "pay debt," is given to several heavy-bearing grapes in various parts of Italy. The one planted at the Experiment Stations seems to be the Pagadebito which occupies a large part of the vineyards along the whole Adriatic slope of the Apennines. It is vigorous, robust, and bears well. A sample of the grapes was received from Tulare on October 14, 1895, in good condition. The bunches were small, cylindrical, well filled, each with a small wing; the berries small, round, juicy, firm, with very thick and astringent skin, good color and flavor, but lacking in acid. Many of the berries were small and abortive. The must showed 21.7% of solid contents by spindle and 0.41% of acid.

Vernaccia Sarda (syn., Austera).—A heavy-bearing white-wine grape of Sardinia. It gives a lighter wine than most of the vines of Sardinia, and is very agreeable, though somewhat rough and a little bitter.

Monica (syn., Munica, Nectarea).—This variety produces the most valued wine of Sardinia. It is a strong grower, somewhat resembling the Mission. A sample of the grapes was received from Tulare on October 15, 1895, in good condition. The bunches were very large, conical, heavily shouldered, well filled; the berries over medium, round, firm, well attached to the pedicel, of good flavor and very sweet, of a dull brownish-purple color. It is an agreeable eating-grape and probably a good shipper, on account of its beautiful bunches, which, though very large, adapt themselves well to packing. The must showed 27.4% of solid contents by spindle and 0.24% of acid.

Ocru di Boe.—A black grape of Sardinia. It has large, conico-cylindrical bunches, very large, oval berries, which are firm, thin-skinned, and of good flavor. It ripens late.

Cipro Nero.—From this grape the most famous wine of the Island of Cypress is made. A sample of the fruit was received from Tulare on October 14, 1895, in good condition. The bunches were of medium size, loose, on slender peduncles; the berries large, ovoid, firm, with thick but tender skin, and good flavor. It appeared to be a good shipping-grape, somewhat resembling the Black Prince, but with less color and more flavor. The must showed 23.0% of solid contents by spindle and 0.42% of acid.

Danugue (syn., Gros Guillaume).—A late table-grape of southern France. The bunches are large, branching, and loose; the berries large, ellipsoidal, firm, juicy, of neutral flavor, and with a very thick, tough skin, of dull black color.

Olivette de Cadenet (syn., Teneron).—A good late table-grape. A sample of the fruit was received from Pomona on September 14, 1895, in good condition. The bunches were large, loose, long-conical, on slender peduncles; the berries large, ellipsoidal, firm, fleshy, with thick but tender skin, and little flavor. Apparently an excellent shipping-grape of green to yellowish color.

Picpoule.—This is one of the most widely cultivated grapes of the south of France. It is a heavy bearer and especially adapted to close, head pruning. Its bunches are of medium to large size, conico-cylindrical, winged; the berries are nearly round and of medium size. It was the principal black grape of Languedoc until it was abandoned in favor of the Aramon, on account of its extreme liability to attack of *oidium.* Now that the *oidium* is successfully combated by sulphur, this

variety may be worth trying in California, on account of its vigor, fertility, and adaptability to poor soils.

Aspiran noir.—This is the white variety of the Verdal, and is more esteemed in France than the latter, both for wine-making and for the table.

Persan.—This is one of the most valued grapes of Isère and Savoy for red wine. It is, however, generally considered inferior to the Etraire de l'Adhui, which it resembles closely.

Chenin noir.—This is one of the chief red-wine grapes of the department of Maine-et-Loire, in the west of France, where it gives good crops, but ripens rather late.

WINES RECEIVED FOR EXAMINATION.

RED WINES.

No. 1208R. *Cabernet Sauvignon*, from Jos. Sladky, Mountain View; received February 14, 1890. Condition good, color light for the variety, acid slightly deficient.

No. 1632R. *Cabernet Sauvignon*, vintage of 1885, from Wm. Pfeffer, Gubserville; received and analyzed April 1, 1892. Color much less than in the following samples of Cabernets from the same place; 19.10 in intensity and verging toward yellow in tint.

No. 1633R. *Cabernet Sauvignon*, vintage of 1887, from Wm. Pfeffer, Gubserville; received April 1, 1892. Color much more intense than in the 1885 sample, 34.80 as against 19.10 for the earlier vintage.

No. 1640R. *Cabernet Sauvignon*, vintage of 1889, from Wm. Pfeffer, Gubserville; received April 1, 1892. Color, 38.10 in intensity; tint, red.

No. 1634RI. *Cabernet Sauvignon*, vintage of 1890, from Wm. Pfeffer, Gubserville; received April 1, 1892. Color, V.R.—63.5.

No. 1635RII. *Cabernet Sauvignon*, vintage of 1890, from Wm. Pfeffer, Gubserville; received April 1, 1892. Color, V.R.—60.6; taste, intensely "tannic." Apart from the sugar still present, the wine is heavy-bodied. The alcoholic contents of this wine having nearly reached the possible limit, the wine hardly runs any risk from the sugar that it contains.

No. 1636R. *Cabernet Sauvignon*, vintage of 1891, from Wm. Pfeffer, Gubserville; received April 1, 1892. Color, V.R.—83.3.

No. 2582. *Cabernet Sauvignon*, vintage of 1889, from Wm. Pfeffer, Gubserville. Condition good; color bright; body high; wine contains a considerable amount of carbonic acid gas.

No. 2596. *Cabernet Sauvignon*, vintage of 1893, from Wm. Pfeffer, Gubserville; received February 28, 1894. Pomace was taken away from must two days after crushing. Color, 4V.R.—30.5; body and color, light; a tart, pleasant wine. The effect of early drawing off from the pomace in reducing the tannin contents of the wine is well shown in this wine.

No. 2597. *Cabernet Sauvignon*, vintage of 1893, from Wm. Pfeffer, Gubserville; received February 28, 1874. Fermented on ¼ pomace. Wine somewhat rough; color more bluish than No. 2596, and read 2V.R.—61.50.

No. 2618. *Cabernet Sauvignon*, vintage of 1891, from Grau & Werner, Irvington, Alameda County; received July 16, 1895.

Nos. 2584–88, 2593–94. *Cabernet Sauvignon*, from T. Parrott, St. Helena. No. 2584 is from the vintage of 1889; No. 2585, vintage of 1890; No. 2586, vintage of 1891; No. 2587, vintage of 1892; No. 2588, vintage of 1893; No. 2593, vintage of 1893 (press wine); No. 2594, vintage of 1893.

The above seven samples of Cabernet Sauvignon wines were received from the late Tiburcio Parrott, of St. Helena, Napa County, on October 6, 1893. They were obtained with the object of showing that California wines made from the typical Medoc varieties of grapes, even wines which are acknowledged to be among the best of their class, are always excessively rich in tannin; that is to say, their astringency is much higher than that of the French Medocs of commerce. A comparison of the analyses of these wines with some recent analyses made by Messrs. N. Gayon, Ch. Blarez, and E. D. Dubourg, of the University of Bordeaux, is very instructive. In twenty-one of the best wines of the Medoc region they found the tannin to range from 0.190% to 0.270%, the average being 0.210%. As the table shows, the St. Helena wines ranged from 0.385% to 0.573%, and averaged 0.483%, which is more than twice as much as is shown by the French Medocs. This explains very clearly why our finest Cabernet Sauvignon wines are not appreciated by many who are used to the smoother French clarets. The mistake made by our wine-makers is in supposing that, to produce a wine of the character of the finest Château wines, they must keep the high-class Medoc grapes undiluted with any grapes of inferior quality. The fact is that all French Medocs are made by blending the highly characterized wines with smoother and more neutral ones. This is generally done in the fermenting-vat, but very often in the cellars, of the Bordeaux wine-handlers.

The finer the quality of a pure Cabernet Sauvignon wine, the more intensified, very often, are its characteristics. It should be looked upon as a concentrated liquid, almost an essence, containing all desirable ingredients, but in too condensed a form to be agreeable to the palate or to be used as a regular table-wine; but to be used to obtain the exact kind of wine desired by the average consumer, by means of blending with clean, fresh-tasting wines of similar but less marked character. It might not be amiss to call attention to the fact that perhaps a great part of the popularity of the Zinfandel is due to the fact that the absolute and relative amounts of its various ingredients generally approach more closely, naturally without blending, to the genuine Claret type than do other varieties which in other respects are much superior to it.

No. 2620. *Cabernet blend*, from Grau & Werner, Irvington, Alameda County; received July 16, 1895.

Nos. 2621 and 2622. *Zinfandels*, vintages of 1893 and 1894, respectively; samples sent by Grau & Werner, Irvington, Alameda County; received July 16, 1895.

The analyses of samples Nos. 2618, 2620, 2621, 2619, and 2622, given in the table, represent the normal composition of wines made from grapes grown on the uplands lying between Mission San José and Irvington, California; well known for the quality of their products. They are pure, natural wines; the small amount of boracic acid shown being derived from the soil which in the northern part of this State always contains more or less of this ingredient, and which is taken up by the vine here, as in Tuscany, Italy.

No. 1207R. *Blend of Cabernet Sauvignon and Malbeck*, from Wilkins & Co.; received February 1, 1890.

No. 1631R. *Verdot*, vintage of 1891, from Wm. Pfeffer, Gubserville; received April 1, 1892. Color, 2V.R.—129.3. A heavy-bodied wine apart from the sugar which it still contains; but there is no obvious reason why this wine should not have fermented out. The acid is very high, yet it does not appear so to the tongue, because of the sugar and tannin, which interfere with its perception. No unsound germs are yet present, however.

Nos. 1637R and 1638R. *St. Macaire*, of vintage of 1890 and 1891, respectively; samples sent by Wm. Pfeffer, Gubserville; received April 1, 1892. No. 1637R, color 2V.R.—57.90; No. 1638R, color V.R.—80.00.

No. 1639R. *Mondeuse*, vintage of 1891, from Wm. Pfeffer, Gubserville; received April 1, 1892. Color, 2V.R.—49.4.

The wines of the district represented by Gubserville are favored with a very unusual amount of tannin. There need be no doubt that the St. Macaire, in this locality, is a genuine Bordeaux, or Claret grape, for both in acid and in tannin it comes fully up to the type, the Cabernets.

Nos. 1622R and 1623R. *Zinfandels*, vintage of 1890, respectively first and second crop; sent by A. Salazar, Mission San José. The wines were examined as to differences in acid, and the result indicates there was no perceptible difference.

No. 1624R. *Blend of Mataro and Zinfandel*, vintage of 1888; sample sent by A. Salazar, Mission San José, April 22, 1891. It contained 0.69% of total acid as tartaric, and 0.09% of volatile acid.

No. 2591. *Alicante Bouschet*, vintage of 1893, from I. de Turk, Santa Rosa; sample received and analyzed December 20, 1893.

No. 2592. *Petit Pinot*, vintage of 1893, from I. de Turk, Santa Rosa; received December 20, 1893.

No. 2599. *Black Pinot*, vintage of 1889, from P. B. Cornwall, Santa Cruz; received and analyzed for acid August 27, 1894.

No. 1218R. *Malvasia*, vintage of 1890, from H. W. Crabb, Oakville; received February 26, 1891. Samples of wines from two tanks, which showed at crushing on October 25, 1890, 40% of sugar: they were crushed cold and have fermented very slowly, still showing 10% and 12% of sugar, respectively.

WHITE WINES.

No. 1204R. *Blend of Chauché gris and Chauché noir*, vintage of 1889, from Wilkins & Co. Wine quite turbid; color light amber; bouquet characteristic; acid not high, but leaves a slight roughness in the throat; taste alcoholic. A microscopic examination of the sediment showed some lactic and a few "effete" yeast germs.

No. 1205R. *Blend of white wines*, vintage of 1889, from Wilkins & Co.; received and analyzed February, 1890. Condition turbid; color pink-red; acid medium; taste not sweet. A microscopic examination of the sediment of the wine showed a very little acetic ferment and some lactic germs, as well as dead yeast-cells.

No. 2595. *Pedro Jimenes*, from J. Bergin, Mountain View; received February 27, 1894.

No. 2628. *Sauvignon vert*, vintage of 1895, from R. Schmidt, Calistoga; received and analyzed February 14, 1896.

No. 2624. *Sauvignon blanc*, vintage of 1893, from G. F. Merriam, Twin Oaks, San Diego County.

No. 2625. *Sauvignon blanc*, vintage of 1894, from G. F. Merriam, Twin Oaks, San Diego County.

No. 2626. *Sauvignon blanc*, vintage of 1895, from G. F. Merriam, Twin Oaks, San Diego County.

The above three wines, though made from Sauvignon blanc, were in no sense Sauternes, but were fortified wines with high sugar contents, which conformed to no type, but were fairly agreeable liqueur wines.

No. 2676. *Riesling*, vintage of 1895, from R. Schmidt, Calistoga; received and analyzed February 14, 1896.

Nos. 1202R and 1203R. *Rieslings*, vintages of 1888 and 1889, respectively; sent by W. G. Klee, January 6, 1890, from Glenwood, Cal. No. 1202R wine in good condition, smooth taste and clean; acid pleasant, but high. No. 1203R wine had fine aroma and high acid; was rendered very pungent by large contents of carbonic acid gas.

No. 2583. *Green Hungarian*, vintage of 1892, from Geo. Husmann, Napa; received and analyzed August 24, 1893.

Nos. 2576 and 2577. *Sauvignon vert*, from F. Sierus, Rutherford, Napa County. Both sound and clean-tasting wines of bright condition and pleasant acid. No. 2577 of more pronounced bouquet and flavor than No. 2576, which, on the whole, does not promise to be a wine of as high quality as No. 2577.

MISCELLANEOUS PRODUCTS.

The nature of the request which accompanied each sample will be understood by the description given. The results of analyses and methods of treatment are detailed under each number as it occurs.

No. 1209. *Champagne*, from Wm. Rueff, San Francisco; received and analyzed February 14, 1890. The sample contained a troublesome black sediment, which, when examined microscopically, showed no definite form. Upon heating the wine the sediment apparently dissolved. Tests showed the presence of lead, but no tin.

No. 2614. *Sample of Wine*, from Santa Clara Valley; thought to be "over fined." The wine showed 0.268% of albuminoids (nitrogenous matter); not an amount in excess of that usually contained in wines of its kind.

No. 2598. *Orange Wine*, from Kinton Stevens, Santa Barbara; received August 13, 1894. The sample contained 17.50% of alcohol by volume, 0.44% of citric acid, and 3.30% of solids. Orange wine is essentially a fortified wine, which may or may not retain a taste of orange peel, according to the methods used in the manufacture. The above sample resembled Sherry and bore no trace of orange peel to the taste. Owing to the amount of labor necessary in the manufacture of this wine, the amount of sugar and acid necessary to be added, as well as of alcohol, this industry does not seem to be profitable. By crushing the skins and not peeling the oranges, a very agreeable liqueur can be made at less expense than the dry orange wine.

No. 1619. *Sherry*, from Santa Clara Valley. A small sample was received April 1, 1891. The wine had become bitter from treatment with powdered limestone. Its total acid content as tartaric was determined to be 0.25%. Upon the addition of carbonate of soda to the extent

of 0.25% the wine showed no precipitate of lime and still had an acid reaction. Double the above amount of carbonate of soda was added, when a large precipitate of lime appeared; this was allowed to settle and the clear wine aërated; a little more fine precipitate appeared. This experiment certainly lessened the *bitterness*, but the soda gave a *mawkish* taste to the wine.

No. 1620. *Sherry*, from Santa Clara Valley; received April 7, 1891. A larger sample of the same wine as No. 1619, but containing a little more acid, or 0.32% represented as tartaric acid; fully one third of this acid was acetic acid. This sample was treated with a slight excess of potassium carbonate, which produced a voluminous light brown precipitate—largely lime. After aërating the clear liquid and allowing the small precipitate thus produced to settle out, the acid was brought to its original amount by the addition of tartaric acid. This experiment rendered the Sherry smooth and not nearly so bitter as when received. By treating the wine with a slight excess of carbonate of potash, removing the resulting precipitate either by filtration or racking, and then bringing the total acid to 0.52% as tartaric, by the addition of that acid, the Sherry was rendered smooth and all the bitterness apparently disappeared.

No. 2600. *Prune Juice;* sample received October 8, 1894, from Prof. Rising, requesting the percentage of alcohol, which was found to be 17.10% by volume.

No. 2602. *Vinegar*, from R. E. Beckweth, Fresno; received November 29, 1894. This sample was claimed to be pure cider-vinegar. It contained 7.29% of acetic acid—rather more than cider-vinegar, which commonly contains from 3.5% to 6.0%.

Nos. 2605 and 2611. *Vinegars*, from Jenison & Strine Bros., of Downey, Los Angeles County. These samples were sold for pure cider-vinegar. No. 2605 was received February 14, 1895, and contained 7.38% of acetic acid. No. 2611 was a larger sample of the same vinegar, and was received April 4, 1896; this yielded 8.07% of acetic acid, 0.74% of extract, and only traces of malic acid. This goes to show that the sample is not pure cider-vinegar, for the extract (0.74%) is just about one half the quantity contained in cider-vinegar; malic acid, a constituent of cider-vinegar, is almost lacking, and the high acetic acid content (8.07%) is over 2% more than the maximum acetic acid in cider-vinegar.

No. 2610. "*Unfermented Wine*," from W. S. Austin, San Diego, Cal.; received March 26, 1895. This wine was sold as a curative for throat and lung troubles. Upon opening the bottle a strong odor of sulphurous acid was noticed; when the sample was heated this acid was strongly evolved. The sample was found to contain 0.596 gram of sulphurous acid per liter (0.0596%), which amount is, of course, too great to be taken into any stomach. Besides the above work this wine was tested for salicylic and boracic acids; however, neither of these antiseptics was present. The liquid showed 22.0% of solid contents and 0.588% of total acids reckoned as tartaric acid. These "unfermented wines" are getting to be quite common in the State. As a matter of fact, they are not wines at all, but merely grape juice, to which some powerful antiseptic has been added; in many cases salicylic acid, boracic acid, etc., are used. So far as is known, the only "unfermented wines" that are not apt to contain injurious additions are those in which the fermenta-

tion has been prevented by the use of heat—pasteurization. The "secret process" of making these so-called "wines" often means that if the ingredients were known, the sale of the "wine" would be impossible.

No. 2629. *Norton's Virginia Seedling Wine*, from Wm. Hotopp, Penn Park Vineyards, Charlottesville, Virginia. This sample was obtained in Virginia by Mr. James P. Langhorne, of San Francisco, and was given to the University for testing. The importance of the sample arises from the fact that the wine is made from "Norton's Virginia," a hybrid that has been highly spoken of as a direct producer—that is to say, a vine that not only resists the phylloxera, but also, without grafting, yields grapes that are said to make good wine. It was found that although the wine was better than that made from most of the American hybrids, such as the Herbemont, etc., yet the "foxy" or musky taste was so prominent as to preclude its use as a true Claret grape. The characteristic "dropping of color" after the wine was made was as strong as noted in the case of wine made from the Lenoir; while the excess of tannin and marked harshness made it a wine that would be useless on the markets of any part of the world, except the locality where it originated, and where the people have become accustomed to these peculiar flavors and aromas. Already in this State "Norton's Virginia" has been highly recommended by some, both as a stock and as a direct producer. Its feeble resistance to the phylloxera when moved from its native habitation, and its peculiarities of taste, however, render it a useless variety for California.

ANALYSES OF WINES SENT TO THE STATION FOR EXAMINATION.

Serial Number	Variety and Vintage.	Sender.	Place of Production.	Date of Analysis.	Alcohol. By Weight	Alcohol. By Volume	Tannin	Acid. Total as Tartaric	Acid. Volatile as Acetic	Body, or Solids	Sugar	Ash
	RED WINES.											
	Dry Red Wines.											
1208R	Cabernet Franc	Jos. Sladky	Mt. View, Santa Clara Co...	Feb. 14, 1890	9.78	12.18	.195	.38	.....	2.70	.....	.....
1632R	Cabernet Sauvignon, 1885	Wm. Pfeffer	Gubserville	April 1, 1892	10.81	13.27	.360	.67	.....	3.10	.....	.....
1633R	Cabernet Sauvignon, 1887	Wm. Pfeffer	Gubserville	April 1, 1892	11.23	13.73	.424	.64	.....	2.55	.....	.....
1640R	Cabernet Sauvignon, 1889	Wm. Pfeffer	Gubserville	April 1, 1892	11.23	13.73	.402	.59	.....	2.60	.....	.....
1634R	Cabernet Sauvignon, 1890	Wm. Pfeffer	Gubserville	April 1, 1892	10.81	13.25	.405	.55	.....	2.05	.....	.....
1635R	Cabernet Sauvignon, 1890	Wm. Pfeffer	Gubserville	April 1, 1892	12.54	15.40	.573	.49	.....	3.23	0.22	.....
1636R	Cabernet Sauvignon, 1891	Wm. Pfeffer	Gubserville	April 1, 1892	11.54	14.10	.516	.48	.....	2.80	.....	.....
2582	Cabernet Sauvignon, 1892	Wm. Pfeffer	Gubserville	Aug. 16, 1893	9.34	11.64	.408	.47	.....	2.60	.....	.....
2584	Cabernet Sauvignon, 1889	T. Parrott	St. Helena	Oct. 6, 1893	.....	.....	.448	.63	.....	.....	.....	.....
2585	Cabernet Sauvignon, 1890	T. Parrott	St. Helena	Oct. 6, 1893	.....	.....	.573	.57	.....	.....	.....	.....
2586	Cabernet Sauvignon, 1891	T. Parrott	St. Helena	Oct. 6, 1893	.....	.....	.448	.67	.....	.....	.....	.....
2587	Cabernet Sauvignon, 1892	T. Parrott	St. Helena	Oct. 6, 1893	.....	.....	.488	.44	.....	.....	.....	.....
2588	Cabernet Sauvignon, 1893	T. Parrott	St. Helena	Oct. 6, 1893	9.78	12.20	.495	.53	.....	.....	.....	.....
2593	Cabernet Sauvignon, 1893	T. Parrott	St. Helena	Dec. 20, 1893	.....	.....	.544	.....	.....	.....	.....	.....
2594	Cabernet Sauvignon, 1893	T. Parrott	St. Helena	Dec. 20, 1893	.....	.....	.384	.....	.....	.....	.....	.....
2590	Cabernet Sauvignon, 1893	I. De Turk	Santa Rosa	Dec. 20, 1893	.....	.....	.502	.....	.....	.....	.....	.....
2596	Cabernet Sauvignon, 1893	Wm. Pfeffer	Gubserville	Feb. 28, 1894	11.62	14.20	.208	.49	.....	2.70	.....	.....
2597	Cabernet Sauvignon, 1893	Wm. Pfeffer	Gubserville	Feb. 28, 1894	12.77	15.70	.307	.60	.....	2.60	.....	.....
2618*	Cabernet Sauvignon, 1891	Grau & Werner	Irvington	July 16, 1895	9.66	12.05	.....	.68	.07	2.80	0.17	.22
1207R	Blend (Cabernet Sauvignon and Malbeck)	Wilkins & Co.	.....	Feb. 1, 1890	.....	.....	.....	.37	.....	2.70	0.00	.....
2620*	Cabernet blend	Grau & Werner	Irvington	July 16, 1895	10.21	12.80	.....	.64	.08	2.71	0.13	.25
1637R	St. Macaire, 1890	Wm. Pfeffer	Gubserville	April 1, 1892	11.08	13.54	.538	.60	.....	2.85	.....	.....
1638R	St. Macaire, 1891	Wm. Pfeffer	Gubserville	April 1, 1892	9.92	12.36	.456	.47	.....	3.00	.....	.....
1639R	Mondeuse, 1891	Wm. Pfeffer	Gubserville	April 1, 1892	10.91	13.36	.471	.47	.....	2.55	.....	.....
1631R	Verdot, 1891	Wm. Pfeffer	Gubserville	April 1, 1892	10.35	12.82	.420	.86	.....	3.02	0.58	.....
1622R	Zinfandel, 1890 (first crop)	A. Salazar	Mission San José	April 22, 1891	.....	.....	.....	.66	.....	.....	.....	.....
1823R	Zinfandel, 1890 (second crop)	A. Salazar	Mission San José	April 22, 1891	.....	.....	.....	.65	.....	.....	.....	.....

2589	Zinfandel, 1893	I. De Turk	Santa Rosa	Dec. 20, 1893			.291					
2621*	Zinfandel, 1893	Grau & Werner	Irvington	July 16, 1895	10.14	12.70		.57	.06	2.68	0.16	.22
2622*	Zinfandel, 1894	Grau & Werner	Irvington	July 16, 1895	10.21	12.80		.57	.13	3.24	0.31	.23
1624R	Blend (Mataro and Zinfandel), 1888	A. Salazar	Mission San José	April 22, 1891				.69	.09			
2591	Alicante Bouschet, 1893	I. De Turk	Santa Rosa	Dec. 20, 1893			.445					
2592	Petit Pinot, 1893	I. De Turk	Santa Rosa	Dec. 20, 1893			.361					
2599	Black Pinot, 1889	P. B. Cornwall	Santa Cruz	Aug. 27, 1894				.42				
2619*	Petit Pinot, 1891	Grau & Werner	Irvington	July 16, 1895	9.98	12.60		.68	.11	2.70	0.14	.26
1218R	Malvasia (tank No. 1, tank No. 2), 1890	H. W. Crabb	Oakville	Feb. 26, 1891	10.50 10.52	13.90 13.81				16.10 14.70		
	Unclassified Red Wines.											
1206R	Mixed reds	Wilkins & Co.		Feb. 18, 1890				.40		2.60		
1629R	Red wine	M. Baumard	San Francisco	Dec. 4, 1891	10.80	13.91				7.30		
2579	Red wine	Solis Wine Co.	Gilroy	June 28, 1893				.49	.07			
2580	Red wine	Solis Wine Co.	Gilroy	June 28, 1893				.64	.13			
2581	Red wine	Solis Wine Co.	Gilroy	June 28, 1893				.65	.08			
2603†	Red wine	J. H. Hague	Gilroy	Dec. 10, 1894				1.42	.74	9.10	3.25	
2604‡	Red wine	J. H. Hague	Gilroy	Dec. 10, 1894				.98	.10	4.90	.25	
2606	A, red wine	Solis Wine Co.	Gilroy	Feb. 18, 1895			.169	.60	.18	2.70	trace	
2607	B, red wine	Solis Wine Co.	Gilroy	Feb. 18, 1895			.170	.61	.08	2.85	trace	
2608	C, red wine	Solis Wine Co.	Gilroy	Feb. 18, 1895			.215	.50	.07	2.70	trace	
2609	D, red wine	Solis Wine Co.	Gilroy	Feb. 18, 1895			.232	.40	.10	2.99	1.41	
2612	Red wine	J. A. Sladky	Mt. View	Apr. 4, 1895	10.69	13.25		.55		2.30		
2613	Red wine	W. E. Hague	Gilroy	May 9, 1895			.189					
1625R	Red wine	E. H. Guppy	San José	Apr. 29, 1891	10.63	13.09				2.60		
2615	Red wine blend	Grau & Werner	Irvington	June 25, 1895	9.70	12.09		.53				
2616	Red wine blend	Grau & Werner	Irvington	June 25, 1895				.72	.15			
2617	Red wine blend	Grau & Werner	Irvington	June 25, 1895	9.63	12.00		.65	.19			
2623	Red wine	W. E. Hague	Gilroy	Nov. 4, 1895	10.28	12.75		.70		2.60		
2630	Red wine, 1891	Solis Wine Co.	Gilroy	Apr. 16, 1896						2.60	trace	
2631	Red wine, 1893	Solis Wine Co.	Gilroy	Apr. 16, 1896						2.50	trace	
2632	Red wine, 1892	Solis Wine Co.	Gilroy	Apr. 16, 1896						2.60	trace	
2633	Red wine, 1892	Solis Wine Co.	Gilroy	Apr. 16, 1896						2.60	trace	
2629	"Virginia Seedling"	Wm. Hotopp	Charlottesville, Va.	Mar. 11, 1896	8.23	11.45	.490	.79		3.10		
	Ports.											
1615R	Port	J. Gallegos	Mission San José	Feb. 7, 1891	15.49	19.49				5.60		
1616R	Port	J. Gallegos	Mission San José	Feb. 13, 1891	13.45	17.20				8.55		
1617R	Port	M. M. Watson	Oakland, Cal.	Feb. 26, 1891	14.82	18.22				9.05		
1626R	Port	Barton Estate Co.	Fresno	Nov. 7, 1891	12.56	16.24	.248	.50		1.68	9.22	.28
1627R	Port	Barton Estate Co.	Fresno	Nov. 7, 1891	15.38	19.78	.346	.41		1.66	9.04	.21
2578	Port	Barton Estate Co.	Fresno	June 5, 1893	18.30	23.58				11.70		
2601§	Port	Barton Estate Co.	Fresno	Oct. 9, 1894		19.00		.93	.38	9.50		

ANALYSES OF WINES SENT FOR EXAMINATION—Continued.

Serial Number	Variety and Vintage.	Sender.	Place of Production.	Date of Analysis.	Alcohol. By Weight	Alcohol. By Volume	Tannin	Acid. Total as Tartaric	Acid. Volatile as Acetic	Body, or Solids	Sugar	Ash
	WHITE WINES.											
2576	Sauvignon vert, 1895	F. Sievers	Rutherford, Napa Co.	June 20, 1895	9.92	12.36	.....	.47	.....	2.25	.....	.....
2577	Sauvignon vert	F. Sievers	Rutherford, Napa Co.	June 20, 1895	9.92	12.36	.....	.47	.....	2.10	.....	.....
2628	Sauvignon vert	R. Schmidt	Calistoga	Feb. 14, 1896	.....	.....	.....	.....	.....	2.28	1.12	.....
2624	Sauvignon blanc, 1891	G. F. Merriam	Twin Oaks, San Diego Co.	Feb. 6, 1896	.....	19.00	.....	.....	.....	4 60	.....	.....
2625	Sauvignon blanc, 1893	G. F. Merriam	Twin Oaks, San Diego Co.	Feb. 6, 1896	.....	16.00	.....	.....	.....	12.80	.....	.....
2626	Sauvignon blanc, 1895	G. F. Merriam	Twin Oaks, San Diego Co.	Feb. 6, 1896	.....	21.00	.....	.....	.....	13.10	.....	.....
2627	Riesling, 1895	R. Schmidt	Calistoga	Feb. 14, 1896	.....	.....	.....	.....	.....	2.10	1.00	.....
1202R	Riesling, 1888	W. G. Klee	Glenwood	Jan. 8, 1890	10.81	13.27	.....	.72	.....	2.20	.....	.....
1203R	Riesling, 1889	W. G. Klee	Glenwood	Jan. 8, 1890	8.48	10.58	.....	.85	.....	2.30	.....	.....
2583	Green Hungarian, 1892	Geo. Husmann	Rutherford, Napa Co.	Aug. 24, 1893	9.36	12.00	.....	.65	.....	1.80	.....	.....
2595	Pedro Jimenes	J. Bergin	Mt. View, Santa Clara Co.	Feb. 27, 1894	14.20	11.62	.....	.45	.....	2.30	.....	.....
1204R	Blend (Chauché gris and Chauché noir, 1889	Wilkins & Co.	.....	Feb. —, 1890	.....	.....	.....	.41	.....	2.10	.....	.....
1205R	Blend "White mixed"	Wilkins & Co.	.....	Feb. —, 1890	.....	.....	.....	.47	.....	2.10	.....	.....

* Boracic acid, well-marked test. † Mannite, 0.902. ‡ Mannite, 0.800. § Potasium sulphate, 0.39 per cent.

PART II.

Phylloxera; by A. P. Hayne.

Fermentation; by F. T. Bioletti.

1. General Principles of Fermentation.
2. Experiments with Pure and Selected Yeasts.
3. Fermentation at high temperatures with addition of various substances.
4. Experiments with color grapes.
5. Asaprol.

Nitrogen in Musts and Wines; by Geo. E. Colby.

Miscellaneous Notes; by F. T. Bioletti.

1. Preservation of Fresh Grapes.
2. Sunstroke of the Vine.
3. Botrytis Cinerea.

List and Contents of Viticultural Reports issued by the Experiment Station and the late Viticultural Commission.

PHYLLOXERA.

By A. P. Hayne.

There is, perhaps, no other insect known to man that has been as much written about as the phylloxera. Every language of the civilized world is represented in its bibliography. It is to be observed, however, that the most valuable and by far the most numerous works upon the phylloxera, and especially the means of combating it, are found in French literature. Although the first description of the insect was printed in English by Asa Fitch, State Entomologist of New York, and by the late lamented C. V. Riley, for many years Entomologist of the U. S. Department of Agriculture, and thus the insect was first observed and named by Americans, yet our literature on the subject is very limited indeed; the best works we have in English, as well as in most of the foreign languages, are either translations or résumés from the French. This is especially true of works describing the means of combating the insect. The reason for this peculiar state of affairs is that, though the phylloxera is an American insect, yet we never had to seriously consider it till long after it had destroyed millions of acres in other countries.

In answer to the question constantly asked by vine-growers, "What book on the phylloxera shall I read, and where can I get it?" let me say that the student not familiar with French should read the reports published by the College of Agriculture of the State University, and those of the late Viticultural Commission. There is no complete work published in English on the subject, but one must look through several publications or annual reports if he would gain all the information to be had. In these reports will be found sufficient details to gain a clear idea of the life-history of the phylloxera, as well as the means of combating it; and in these publications will be found a complete list of works published in all languages on the subject.

The most *incomplete* part of the literature, both American and foreign, is that which treats of resistant vines and their adaptation. The reason for this is, that the subject is so new that sufficient time has not elapsed to enable the authors to make use of complete returns from experimental vineyards and stations. It is the purpose of the College of Agriculture to embody in a special bulletin a summary of the knowledge thus far obtained, which will appear about December, 1896. In this the subject of resistant vines will be thoroughly discussed.

The viticultural staff of the College of Agriculture is always ready to answer questions relating to this or kindred subjects, as well as to make such inspection and investigation as may be called for.

Home of the Phylloxera.—The phylloxera is not a California insect; it was introduced into this State either directly from that part of the United States east of the Rocky Mountains, or indirectly from Europe after the trans-Atlantic invasion, or from both. It should be here noted

that the day for theorizing by amateurs in this matter is passed. It has been established beyond the possibility of a rational doubt that the phylloxera has existed on the American vines in their native forests for ages. That it exists and has existed on these American vines proves that these vines really do resist the attacks of the insect under certain conditions; but not, as many claim, that the insect cannot live on the roots of the American resistant vines. The phylloxera is always found on certain Eastern wild vines, only these vines are not killed by the sting of the insect, as is the case with the non-resistant European and Asiatic species.

In speaking of American vines we do not mean to imply that all resist equally well, or that all are of the same practical value even though the absolute resistance be the same. Some of the species are practically of no value, owing to the difficulty of propagation, either from cuttings or graft. It must also be remembered that the vines that are natives of the Pacific Coast have not been exposed to the ravages of the phylloxera until within a very few years, and thus it is that the same conditions do not obtain here as in the East.

It being granted, then, that California has been invaded by the phylloxera, having before been free from it, we are led to study the behavior of the insect rather in those countries that, like California, have been *invaded:* countries in which the phylloxera has encountered conditions differing from those existing in its native breeding-place. More especially do we look to those countries which, like California, use only the *Vitis vinifera*, or European species, instead of resistant American species. We thus have a much wider field, and are enabled to profit by the many years of experience of those who have wrestled with the problem for a longer time and in a more serious manner than ourselves. We can thus begin where they left off, and avoid making the same mistakes and repeating the very same experiments and failures which they experienced nearly a quarter of a century ago. Logical as this may seem, there are still some viticulturists who scorn to look beyond the borders of their own vineyards. This spirit of self-sufficiency is most fatal to any rational progress; and the sooner people admit that they do not in reality "know it all," the better it will be for the vine interests of the country.

Aside from the practical means of combating the phylloxera, it is very useful for us to study the behavior of the insect immigrant, in order to get a good idea of its biological changes under new conditions. It is very certain that the vast interests at stake, as well as the greater number of years of acute affliction, have caused the Europeans to make the most careful and thorough study of the insect itself, and the means of combating it. In America, then, we must draw most of our information from abroad.

The History of the Phylloxera in California has been told so often that we will give but a brief résumé, referring those desiring further information to the publications referred to in the beginning of this article. It is to be noted that we in California behaved, in regard to the pest, just as did the inhabitants of other countries. At first we made light of it; then we refused to allow it to be known how serious the trouble was, regarding it as an insult to be told that the pest had infected our vineyards. This is noted to-day in certain vineyards, such as those of the

Champagne region in France. There, quite recently, the peasants resented the imputation so strenuously that it took regiments of soldiers to enforce the quarantine rules laid down by the Government. In California, though we have had no bloodshed, there was much ill feeling engendered; so much so that even to this day some refuse to accept the inevitable, or to listen to those who would assist them.

At the beginning of the invasion of the pest, the State University undertook the study of the local biology of the insect; and its work in this regard stands true to-day, and has been confirmed by the best scientists of the world. Numerous systematic experiments suggested by vine-growers, chemists, and entomologists as to the means of combating the terrible insect, were undertaken. Some misapprehension exists in the minds of many as to the object of an experiment, and it may be well to call attention to the fact that *experiments are sometimes as valuable when they fail as when they are successful;* indeed, it may be said that *experiments never fail to do good.* If a supposed remedy is thoroughly tried and found to be useless, the experiment is valuable in showing that practical men will waste time and money in trying it again. It is by this system of exclusion that good and true remedies are found. It is proper to allude to this, because much has been written by irresponsible parties tending to cast ridicule on experiments that did not result in finding a practical remedy; as though remedies were *ever* found at once without preliminary trials. Thus, it was at one time suggested abroad that, as the fumes of mercury are fatal to the phylloxera, it might be possible to utilize this as a means of combating the insect on the roots of the vine. A series of experiments were undertaken in every country in the world by the best scientists and practitioners. At first it appeared as though the proposed remedy might be practical, owing to a misconception of the amount of mercury and the time necessary to saturate the soil with its fumes. Systematic experiments showed that the quantity necessary was too great to admit of practical use in vineyards on a large scale; and because this did not prove a "sure cure," some ignorant persons made, and indeed are now making, an outcry against all experimentation.

Among other facts brought out by the systematic investigations made by the College of Agriculture was the fact that the winged form of the phylloxera (and hence the sexual form) is comparatively scarce in California. This led some dilettanti who desired to pander to the popular ideas to proclaim loudly that there was really no danger from the phylloxera. They said that it had been "localized," and that owing to "climatic conditions" it would not spread. While it is perfectly true that, for some reason, the winged form is rarer in California than elsewhere, it is none the less true that it does exist; and therefore that the phylloxera will continue to spread and multiply.

This was pointed out by the College of Agriculture years ago, but was disregarded. To-day the truth of the predictions then made is verified in only too striking a manner. That little attention was given to these warnings was due to several causes, the most powerful one being that the price of wine fell to so low a point that many vine-growers did not wait for the phylloxera to destroy their vineyards; but anticipated certain destruction by rooting out the vines and planting other crops. In this way many vineyards that never should have been planted were gotten rid of, and, so far as it went, this was an advantage.

There are several reasons why the phylloxera spreads more slowly in this State than in other countries. The fact that the winged form is very rare is among the chief; and hence that infection comes mainly from the wingless insects, which must be bodily carried by persons, wagons, boxes, or implements, and cuttings—adds materially to the efficacy of this impediment. In our dry atmosphere the swellings resulting from the bite of the phylloxera are not so quick to develop and spread over the surface of the roots; for it must be remembered that the injury by the phylloxera to the vines arises not so much from the amount of sap that it sucks from the roots or leaves, but mainly from the swellings that form where the insect inserted its sucking apparatus, and which start decay of the roots. The richness and freshness of our soils, together with the slower progress of decay, often enable a healthy, well-cared-for vine to throw out new roots almost as fast as the old ones are destroyed. This gives our vines a longer lease of life after being attacked than is the case in other countries; but it is none the less true that in the end they succumb to the fatal attack of the insect.

Soon after the outbreak of the phylloxera in California, the State entrusted the viticultural interests to a picked commission of vine-growers, and for fourteen years the field work was taken out of the hands of the College of Agriculture, owing to the absence of appropriations. Although it had no money for field investigations, the College staff was many times requested to make such investigations at the expense of parties desiring them; and it was during some of these that it was found that, so far from the phylloxera having been "localized," as had been said, the regular course of events had been followed, as had been predicted years before. That is to say, there had been no "localization" at all, but the insect had spread unchecked from region to region, and is still spreading wherever there are vines to live upon. Thus, it was found to have existed in the well-isolated Livermore Valley for years, although these vineyards had been pronounced uninfested. It was found all through the Santa Clara Valley, on the top of the Santa Cruz Mountains, in the Alhambra Valley in Contra Costa County, and in hitherto uninfected parts of the Sacramento Valley, as well as elsewhere.

Just at this time a marked revival in the wine industry took place, and the State abolished the Viticultural Commission and turned over the technical work to the College of Agriculture and the United States Experiment Station connected with it. Owing to legal difficulties, the funds appropriated for that purpose did not become available for eight months afterward, so that active work under the new arrangement has but just begun, and active measures inaugurated to insure the vineyards all aid possible in combating the phylloxera and other vine pests. The results of this work will be given to the public in advance of the regular annual report in bulletin form, as the work progresses.

FERMENTATION.

By F. T. Bioletti.

GENERAL PRINCIPLES OF FERMENTATION.

With every new vintage it becomes more clearly understood that an exact knowledge of the fundamental principles of fermentation is essential to the constant production of good wine. If we would avoid the evils of stuck tanks, lactic, mousy, acetic wines, we must know the causes and conditions favorable to these evils, and how to remedy them. Even leaving aside the unsound wines, of which I will venture to say every cellar produces more or less, it is well known that there is great difficulty in producing a uniform type of wine year after year. Though the raw material is apparently the same, the wine of one year differs in quality and character from the wine of the next. This is a serious difficulty; especially to those who desire to establish a characteristic and constant brand of wine. Any plan, therefore, which promises to overcome this uncertainty is worthy of thorough trial. Such a plan is the *use of pure yeasts or ferments*, the outcome of the study of fermentation made by recent investigators. These pure yeasts have now been used extensively for four years in France and other countries, and last year were tested in California, as shown elsewhere in this report.

Another very important improvement in the methods of wine-making is the *use of cooling machines or refrigerators*. Temperature-control, though not new in theory, has been applied with practical success to wine-making only within the last two or three years. In order to render clearer the theory and practice of these two improvements—the use of pure yeasts and temperature-control—a short account of the nature of fermentation is here given.

HISTORICAL.

The phenomenon of fermentation has been known from the earliest times, but it is only within the last fifty years that anything very definite has been known of its causes and its mode of action. The alchemists considered it a kind of purifying process, in which the alcohol already existing in the liquid threw off the impurities which disguised its presence. Leuwenock, in 1680, by the aid of a microscope, first discovered the presence of minute, roundish bodies in fermenting liquids. Becker in 1682 and Stahl in 1697, connecting these bodies with the phenomena of fermentation, formulated a theory very much resembling that afterward elaborated and sustained by Liebig. The vital theory of fermentation was first suggested by Cagniard-Latour, who, in 1835, stated it in this form: "The globules of yeast seem only to act upon a solution of sugar whilst they are alive; from this it is probably to be concluded that it is by some effect of their vegetation

that they set free carbonic oxid and convert the solution into an alcoholic liquor." This theory received strong support from the works of Pasteur, where the vital theory is more definitely stated. Pasteur says: "The chemical act of fermentation is a phenomenon essentially correlative with a vital act, commencing and ceasing with the latter. I believe there is never an alcoholic fermentation without a simultaneous organization, development, and multiplication of yeast globules, or continued life of the globules already formed."

The so-called mechanical theory, which received the support of the famous German chemist, Liebig, is thus stated by him: "The elements of fermentable bodies are easily displaced and have weak affinities for each other; they are thus easily caused to form new groups. In order that this transformation should take place, it is only necessary that the elements should receive a sufficient mechanical impetus. This is given by the ferment. Ferments are not particular bodies, but any nitrogenous matter in process of decomposition." This theory, though practically abandoned at the present day, was accepted as late as 1879, with slight modification, by Naegeli, who thus briefly summarizes his views: "Fermentation is the transmission of the state of movement of the radicals and atoms of the different constituents of the living plasma to the fermentable matters; by this transmission the equilibrium of the molecules is disturbed, and thus they in their turn become decomposed." Liebig's theory denies altogether that fermentation is a vital phenomenon. Naegeli admits that a living organism is the initial cause, but seems to consider the progress of the fermentation as a purely chemical phenomenon, not depending on the vital processes of the organism. Pasteur's theory, on the contrary, is that fermentation and the vital functions of the accompanying organism are inseparably connected under the conditions where fermentation takes place.

There have been other theories of fermentation, which have all been easily shown to be false. The most notable of them are Schwieger's electrical theory and Berzelius's catalytic theory. Schwieger considered that the yeast cells formed a kind of electric battery, and broke up the sugar by a kind of electrolysis.

At the present time it is conceded by all investigators that every true fermentation is accompanied by a living organism which is in some way the cause of the phenomenon; the exact mode of action, however, is still in dispute. Regarding this mode of action, there are two main theories, that of Berthelot and that of Pasteur. Berthelot and Bernard maintain that the yeast cells excrete an amorphous substance which they call *zymase*, which is the real cause of fermentation, and acts as an enzym or soluble ferment independently of any action of the yeast plant itself. They have not, however, succeeded in separating this zymase, though an analogous substance has been separated from yeast cells, called sucrase or invertase, causing the inversion of cane sugar. O'Sullivan has lately shown that invertase is not excreted by healthy cells, and that the inversion of sugar takes place within the cell. It is therefore possible that the zymase of Berthelot exists in the cell, but cannot be separated, on account of its easily decomposable nature. According to Pasteur, fermentation (he is referring to alcoholic fermentation) may be defined as life without air. When a yeast is grown with free access of air it consumes oxygen, as do plants in general, in the exercise of its vital functions and does not require glucose. But when

grown in a solution of glucose (grape sugar) out of contact with the air, in what Pasteur calls the anaërobic state, it attacks the glucose, breaks it up into several substances, and from it obtains the oxygen needed. The fermentative power of yeast, he says, is at its maximum when completely deprived of air, and decreases to zero when allowed full access to atmospheric oxygen. Fermentation, then, according to this view, is a phenomenon of nutrition, and a natural and essential part of the life economy of the plant.

Recent experiments have made it necessary to greatly modify Pasteur's views. It has been shown that, instead of the absence of oxygen being essential to the most perfect fermentation, the presence of oxygen under certain conditions actually increases the fermentative power of yeast. In fact, it seems probable that the presence of a certain amount of free oxygen is essential to the life of the yeast plant, even in its anaërobic or fermentative condition. A. J. Brown has lately shown that the fermentative action of yeast cells is not connected with their growth or reproduction, and that fermentation may continue in a liquid while the size and number of the yeast cells remain unaltered or diminished. These results support one of Liebig's views which was opposed by Pasteur, viz., that fermentation and the growth of yeast are not necessarily connected phenomena. Brown proposes the hypothesis that yeast cells can use oxygen in the manner of ordinary aërobic (air-growing) fungi, but that the exhibition of their fermentative functions is independent of their environment with regard to free oxygen, basing his hypothesis upon the same experiments which led Pasteur to an opposite conclusion, together with some new experiments made by himself.

The knowledge of the connection between micro-organisms and fermentation is thus of comparatively recent date, and the exact nature of this connection is still far from being thoroughly understood. On the other hand, the nature of the chemical changes which take place during alcoholic fermentation was investigated and very well explained by Lavoisier at the end of the last century. He showed that the sugar contained in the fermenting liquid was broken up into nearly equal parts of alcohol and carbonic acid gas. Pasteur, by improved methods, found that other substances besides alcohol and carbonic acid are produced, and gave the following proportions:

Alcohol	48.37%
Carbonic acid	46.57
Glycerine	3.22
Succinic acid	.61
Loss	1.23
Grape sugar	100.00%

The part put down as "loss" was supposed to be consumed by the yeast. This formula, though substantially correct for a pure fermentation, is subject to variation, for it has since been shown that different varieties of wine yeast will yield different proportions of alcohol. In actual practice the amount of alcohol is generally found to fall short of that indicated by Pasteur's formula. Some of the alcohol is carried off by the carbonic acid gas and by evaporation, especially in hot fermentations. If other micro-organisms besides the ordinary wine yeast are present, still more of the sugar is consumed without the production of alcohol, and other substances, such as lactic and acetic acids, are formed in the wine.

Since the investigations of Pasteur, published thirty years ago, the importance of discriminating between the fermentation caused by different yeasts has been well recognized by brewers, who have modified their methods in accordance with the facts proved by him. It is well understood by them that if a perfect fermentation is obtained the remaining part of beer-making and -keeping is comparatively simple.

This is equally true with regard to wine. There is no period in the history of a wine where its quality may be made or marred with more certainty than during the critical period of fermentation. Pasteur showed how deleterious were the effects of molds and bacteria upon the quality of a fermented liquor, and how important it was to exclude these organisms as much as possible from the murk, and to avoid the conditions favorable to their development. His studies of lactic and acetic ferments made it possible, in most cases, to avoid the injury done by these pests of fermented liquors, and aided materially in the production of sound beers and wines. He was also, perhaps, the first to suggest that even when bacteria of all kinds were absent from the fermenting liquor there were differences of quality produced, which were due to difference in the yeast itself.

It was not, however, until the investigations of C. Hansen, made some ten years ago, showed that each so-called yeast was really a mixture of numerous species, each with its own distinct characteristics, that it was possible to put brewing on an absolutely scientific basis. Previously, it was supposed that there were two kinds of brewer's yeast, top and bottom: the former a yeast which maintained itself throughout the fermenting mass and required a higher temperature, the latter a yeast which remained at the bottom and performed its functions at a lower temperature. Hansen, however, showed that each of these yeasts contained several kinds, some of which were more or less injurious to the quality of the beer. Some of them caused the beer to remain turbid; others made it bitter or gave it a disagreeable odor. Acting upon this knowledge, he devised a method for freeing the true beer yeast from all other kinds, and thus obtained a perfectly pure yeast.

When this was done, the last element of chance in beer-making was practically eliminated. From a certain kind of raw material it became possible, by means of perfect control of temperature, aëration, etc., and the exclusion of all organisms but the pure yeast, to make a perfectly definite and invariable product. This use of pure yeast in breweries has become widespread in Europe, and ten years of use have proved it an unqualified success.

On account of certain peculiarities in the conditions of wine-making, there have been greater difficulties in the application of Hansen's principles to this industry, and it is only within the last four years that it has been attempted. The impossibility of sterilizing the grapes was at first thought to be an insuperable objection to the use of pure yeast, but experience has shown that though injurious ferments cannot be entirely excluded, their action can be reduced to an inconsiderable minimum.

Marx, following the methods of Hansen, has succeeded in isolating and studying over fifty species (?) of wine ferments. These, however, are many of them doubtless only varieties of the ordinary *Saccharomyces ellipsoideus*, or wine yeast, for as great differences have been found between different selected races of the same species as between these so-called species. Rommier, in 1889, was perhaps the first to apply

the facts learned about selected ferments to actual wine-making. He crushed a quantity of a certain grape, and fermented different parts of it with different cultivated varieties of *S. ellipsoideus*. Each resulting wine he found differing from the others in flavor and bouquet. Later in the year, Martinand made experiments in the same direction. He fermented a must, not like Rommier with pure cultures, but with yeasts taken from different sources. He took one from a spontaneous fermentation of cherries, one from a wine of Burgundy, one of Champagne, and several others. He found in each case that he obtained wines suggesting those from which the yeast had been obtained. After this, Rommier made some still more convincing experiments. He took an artificial must containing sugar and the necessary salts, and fermented different portions of it with yeasts taken from different wines. He then distilled the wines and obtained brandies of very distinct aromas and of different intoxicating powers, though the alcoholic strength was the same in all cases. Jacquemin has made the latest experiments in this line. Some of his first experiments were with ordinary beer wort. By the addition of tartaric acid and fermentation with the appropriate yeast, he claims to have succeeded in producing wines having distinctly the character of Bordeaux, Burgundy, Champagne, etc.

PURE AND SELECTED YEASTS.

Yeasts, as is well known, are species of fungus and consist of minute roundish cells so small that it would take 500,000,000,000 of them to fill a vessel one inch cube. These cells produce by budding, and when growing in an acid, saccharine fluid, such as beer wort or grape must, produce the phenomenon of fermentation, and are therefore often known as *ferments*. Yeast as usually seen is a cloudy, frothy liquid, which, when examined under the microscope, shows the roundish, unicellular ferments floating in the liquid, either singly or in clusters of two or three. Most of the yeasts used in the manufacture of beer, and all, until late years, of the yeasts used by wine-makers, consist not of one but of several varieties or species of ferments.

Some of these varieties are useful in varying degrees and some are harmful, and the great service which Hansen has done to the brewing industry, and indirectly to wine-making, is to have made a thorough study of these ferments and thereby settled which are harmful and which beneficial, and also to have chosen and separated out the best varieties. These varieties are now produced in large quantities and sent all over Europe, where they are known as Hansen's No. 1 and Hansen's No. 2. One is especially useful for the production of export beer and the other of beer for quick consumption.

The ferment of beer is known to botanists (for yeast is a plant) by the name of *Saccharomyces cerevisiæ*. Wine yeast resembles it closely in form, but differs notably in the quality of its products. It is known as *Saccharomyces ellipsoideus*.

The name *Saccharomyces ellipsoideus* is applied to wine yeast in general, being the name of the species. But, just as there are innumerable varieties of the species *Vitis vinifera*, or European grape, so there are dozens of varieties of wine yeast, or hundreds if we are to believe Marx and other investigators, and it is reasonable to suppose that some of these, if not harmful, are at least less useful than others.

Given the same amount of care, skill, and good luck, the quality of a wine is generally supposed to depend on two things, viz., the quality of the grape and the location of the vineyard. However, we must now add another factor—the variety and purity of the yeast. The investigations and experiments of Reitsch, Martinand, Jacquemin, and others leave no doubt of the great influence of the use of certain kinds of yeast on the quality of the resulting wine. It may be said to have been distinctly proven that by the use of pure and selected yeasts wines can be greatly improved in clearness, alcoholic strength, cleanness of taste, and in quality generally. The further claim of the most ardent advocates of pure yeasts, that by the use of appropriate kinds, any character, as for instance that of "Vin de Bordeaux," Champagne, Burgundy, etc., can be produced with a neutral grape, may be considered as yet problematic. However this may be, the use of Jacquemin's pure, selected yeasts is an assured success, for whereas in 1891 only a few

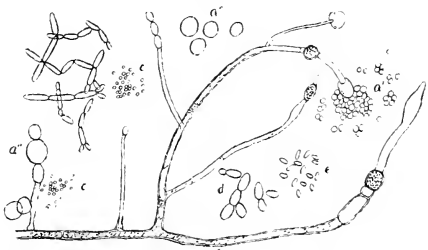


PLATE I.

a, *a'*, *a''*. Various forms of a mold, (*Mucor*).
c, *d*, *e*. Various forms of yeasts, molds, and bacteria.

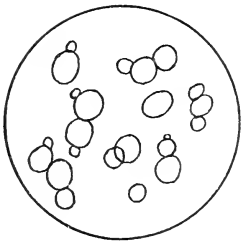
wine-makers experimented with them, in 1894 thousands of wine-makers all over France used them on an industrial scale.

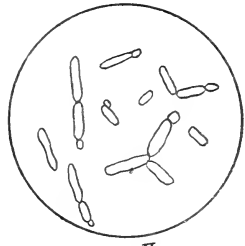
Jacquemin has established a laboratory, which he calls "L'Institut La Claire," in the Jura Mountains of eastern France, at an altitude of more than 3,000 feet. Here, in an atmosphere free from germs, he selects the yeasts of all the finest vintages of France and other countries, frees them from all foreign and injurious organisms, and finally cultivates them in a perfectly pure state, and sends them in large quantities all over France and to other vine-growing countries. He supplies the special ferment of Sauterne, of Chianti, and of Johannisberg. Ferments can be obtained from him which will produce the maximum amount of alcohol from a given amount of sugar; ferments for hot countries, for cold countries; ferments for cider, for perry, for honey wine—all supposed to differ in some way and to be appropriate to different uses.

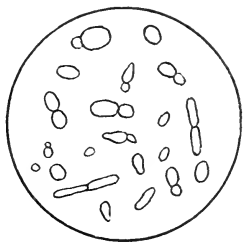
Whether all that is claimed for these yeasts is true or not, they are all certainly pure, and, as such, are of the greatest value in the production of good, sound wine.

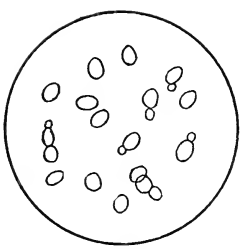
Many French wine-makers consider that by the use of these pure yeasts they have improved their product by from 10% to 50%. This can be readily credited when we consider the ordinary process of wine-making.

When the grapes are brought to the winery the skins and, still more,









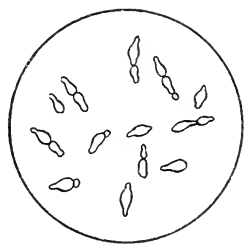


PLATE II.

I. *Saccharomyces cerevisiæ* (beer yeast).
II. *Saccharomyces pastorianus* (injurious yeast).
III. Mixture of forms found in first fermentation of a California wine.
IV. *Saccharomyces ellipsoideus* (wine yeast).
V. *Saccharomyces apiculatus.*

the stems, are covered with the spores of a multitude of ferments, molds, and bacteria, all of which enter into the race for precedence—"fair field and no favor." The race is to the strong, and the strong is the organism most suited to the conditions, but not necessarily most suited to the end in view, viz., the production of a thorough alcoholic fermentation. The above figure shows some of the many forms of micro-organisms found upon the skin of a Muscat grape from Fresno. Fig. I, Plate II, shows the appearance of a pure culture of beer yeast, and Fig. II of one of the injurious yeasts found in ordinary beer fermentations. Fig. III represents an ordinary California yeast, showing the mixture of forms that almost always occur in the early stages of fermentation. The forms shown are all yeasts or molds; the bacteria do not develop in appreciable quantities till later. Fig. IV was drawn from a pure yeast from Algeria, and shows the comparative constancy of form of a pure culture, the differences of size simply indicating differences of age. All these figures are magnified about 1,000 diameters, and consequently represent the cells 1,000,000,000 times larger than they actually are. Fig. V is *Saccharomyces apiculatus*, found commonly on unripe grapes and very acid fruits, such as gooseberries and red-currants.

As a rule the first fermentation is caused principally by the *Saccharomyces apiculatus*, a small alcoholic ferment which does no great harm except that it uses up more sugar in the production of a certain amount of alcohol than does the proper wine ferment. The apiculate yeast, being paralyzed by 2% or 3% of alcohol, soon gives way to the genuine wine yeast, which, in the most favorable cases, carries on the fermentation to dryness. In the meantime, however, the molds and bacteria have been developing, and, if anything happens to check the action of the wine yeast, they take possession and give us various varieties of milk-sour, mousy, and pricked wines.

All these organisms have two well-marked forms, which may be called the active and the inactive. When in the former state they commence to operate the moment they come in contact with the must; when in the latter they do not commence active work for hours and sometimes days after being placed in the liquid. Most of the yeasts, molds, and bacteria exist on grapes in the resting-spore or inactive state, as we see by the length of time which the first crush of grapes takes in starting to ferment. Now, the practical application of the method of fermenting with pure yeasts depends on the fact that they are put into the must in fully active condition. In this way they take complete possession of the fermenting mass before the "wild yeasts" and injurious organisms have awakened from their comatose state. We thus obtain a good, clean fermentation, and avoid the production of those unpleasant odors and tastes which the undesirable organisms that are present usually communicate in a more or less marked degree.

ORIGIN OF YEAST.

Exactly what the true wine yeast (*Saccharomyces ellipsoideus*) is, or where it comes from, has not yet been determined. It seems probable, according to the latest investigations, that it is an imperfect form of some of the higher fungi, either of a mold or of one of the *pyrenomycetes*. All that we know certainly of its origin is that the spores, together with the spores of many other organisms, are found upon the outside of ripe

grapes. It has been proved that the spores of the apiculate yeast (*Saccharomyces apiculatus*) pass the winter in the soil, but where or in what form the ordinary wine yeast hibernates is not known.

Among the organisms found on the surface of the grape, one of the most plentiful is the *Mycoderma vini*, or "wine flowers." This ferment develops during fermentation, together with the yeast, though its presence is not perceptible under ordinary conditions until fermentation is almost over and the yeast sinks to the bottom. The "wine flowers" then manifests itself by forming a veil on the surface of the wine.

There are various yeasts, pseudo-yeasts (*Torulæ*), and molds which consume or break up the sugar with the production of very small quantities of alcohol. The sugar thus consumed is therefore lost. The loss from this cause is generally at least 10%, and often as much as 15% or 20%; that is, a must containing enough sugar to give, according to Pasteur's formula, 13% of alcohol, will give from 10% to 12% only. This might, at first sight, be considered an advantage in the production of light, dry wines, though there is a loss of raw material. But the action of these organisms is not confined to the destruction of the sugar; besides this, their products of elimination have a deleterious effect on the quality of the wine, and less wasteful methods can be adopted for reducing the alcoholic contents.

Unripe grapes have few or no yeast spores adhering to them. The micro-organisms found on unripe grapes are principally molds; later, as the grapes ripen, the apiculate yeast (*S. apiculatus*) appears, and at complete maturity the true wine yeast (*S. ellipsoideus*) is found. The molds, apiculate yeast, and spores of bacteria occur also on the perfectly ripe fruit.

All these organisms decompose and eliminate the sugar to a greater or less extent, but the products into which the sugar is changed vary greatly for each. The apiculate yeast, for instance, produces less alcohol than wine yeast from the same amount of sugar, while the amount of alcohol yielded by the action of molds and bacteria is inconsiderable. The amounts of glycerine, succinic acid, and the quantity and kind of the various acids and ethers on which the quality of the wine so much depends, vary in an even greater degree, not only according to whether molds, bacteria, or yeast are present, but also according to the particular variety or race of yeast which predominates. It is on these facts that the method of the amelioration of wines by means of races of yeasts, originating in the famous vintages of the Medoc and Burgundy districts, depends. The spores of the true wine yeast are much less numerous, even on ripe grapes, than those of other micro-organisms. This is not due to the absence of spores of *S. ellipsoideus* in the air, but to the fact that the surface of grapes, especially when unripe, does not present the conditions favorable to the growth or existence of wine yeast.

The scarcity of yeast germs on the grapes is well illustrated by the length of time which the first vat of grapes of the vintage requires to begin its fermentation. The reason why the later vats start so much more promptly is that all the utensils, chutes, vats, etc., even after an ordinary complete cleaning, retain enough yeast cells to thoroughly leaven the whole mass of grapes.

CONDITIONS OF FERMENTATION.

Leaving out of consideration, for the moment, the addition of wine yeast, it is possible, by proper attention to conditions, to make the true wine yeast predominate over all the other micro-organisms which enter into the fermenting-vat. If the grapes are strongly acid, the bacteria will have little chance to develop, as they are best suited to a neutral or slightly acid medium. A low temperature is also unfavorable to the development of bacteria and of *Mycoderma vini* (wine-flowers). The temperature most favorable to the growth of wine yeast is between 75° and 85° F. A lower temperature is more suitable to the apiculate yeast, so that if the temperature be kept below 75° F. there is danger that the elliptical yeast will not be able to overcome it. This is especially true of musts of low sugar contents, for the antiseptic power of sugar is more effective with the apiculate than with the true elliptical wine yeast. As the former exists and enters into the vat in the proportion of 100 to 1 of the latter, it will often be three or four days, when the temperature is low, before the latter obtains the ascendency. The danger in this is a slight loss of alcohol, a lowering of the character of the wine, and a difficulty in clearing it. If the temperature is too high, on the contrary, both yeasts are killed or paralyzed, and the lactic and acetic bacteria, *Mycoderma vini*, and other injurious micro-organisms take their place. There is, then, greater danger from a too high than from a too low temperature. The trouble with "stuck tanks" and the inferior quality of the wine produced by them will illustrate this.

The objections which have been urged, very properly, against the addition of bread or beer yeast, are thus easily explained. To add a variety of yeast unsuited to the purpose in view would be bad, but to add a species adapted to the conditions of bread- or beer-making would be absolutely fatal to a wine. The yeast would certainly become diseased when subjected to conditions of nutritive medium so different from those proper to it. It would form products which would give undesirable flavors and odors to the wine, and, even if healthy, would produce a liquor resembling beer as much as wine. Moreover, as these yeasts are paralyzed by a lower percentage of alcohol than is usually found in wine, they would certainly fail to produce the effect desired, viz., to ferment out the last of the sugar.

The chemical composition of the wine, not only as regards the essential ingredients of alcohol, acid, glycerine, etc., but as regards the ethers and substances on which the bouquets of various wines depend, is influenced, not only by the race of yeast employed, but also by the composition of the grapes and the conditions of temperature and aëration under which the fermentation takes place. Part of the variation due to these influences is from direct chemical changes and decomposition, caused by heat and oxygen, but even more, especially as regards the minute quantities of volatile ethers, to the state of health of the yeast. Anything which interferes with the healthy development and growth of the yeast changes its normal products of excretion, and causes it to form substances which seriously impair the quality of the wine.

If a vat of grapes be started with yeast from an already fermenting vat, care should be taken to perform the operation at the right moment. If the yeast be taken at the beginning of the fermentation, the apiculate form will predominate; if at the end, there will be a larger amount of

Mycoderma vini and the vinegar bacterium. The yeast, then, should be taken at the height of fermentation, for at that time the *S. ellipsoideus*, or true wine yeast, predominates, and is in its most active condition.

PURIFICATION AND SELECTION OF YEASTS.

The separation of one micro-organism from others can be made in a somewhat imperfect way by preserving, for several generations, those conditions of environment most favorable to the organism it is desired to propagate. For example, if a small quantity of yeast contaminated with bacteria be put in a nutritive sugar solution which has been made highly acid with tartaric acid, the yeast will develop freely, and the bacteria with difficulty or not at all. If, now, another fermentation be started from this one in a similar solution, the relative number of bacteria will be still further decreased. If this operation be continued several times more, most kinds of bacteria will be completely eliminated, and the yeast obtained comparatively pure. Other micro-organisms may be gradually eliminated by similar series of cultures maintained at a temperature more favorable to the yeast than to the organism it is desired to get rid of. This shows the importance of constant endeavor to maintain during fermentation all the conditions of temperature, must-composition, etc., most favorable to the yeast. In this way many of the injurious ferments are destroyed or kept within innocuous limits, and fairly pure fermentations obtained.

Late experiments tend to show that fluorid of ammonium can be used successfully in the purification of yeast. The yeast is first "trained"; that is, it is cultivated through a series of musts containing gradually increasing quantities of fluorid of ammonium until it is rendered capable of existing in liquids containing an amount of the fluorid insupportable to most other micro-organisms. In this way the sugar in solutions may be made to produce as much as 2% more alcohol than when fermented in the ordinary way, on account of the absence of those ferments which consume the sugar without a corresponding production of alcohol. This method is said to have been used successfully in the fermentation of murks for distillation.

The method of purification and selection which is used at present for practical purposes is that invented by Hansen. Without describing the minutiæ of the process, it is sufficient to say that it consists essentially in the isolation of a single yeast cell. This single cell is placed in an absolutely sterile nutritive solution, where it reproduces and increases until a yeast is obtained of which every cell is a lineal descendant of the single cell first chosen. Experiments are then made with this yeast to determine its characteristics, such as its optimum temperature, the amount of alcohol it will produce, the quality of wine or beer which it will make. In this way many different yeasts are obtained, each the product of a single cell, and each having different characteristics. Those most suitable to the object in view are preserved and can be propagated indefinitely. The original or mother cell is taken, of course, preferably from the best beers or wines, in order to increase the chance of obtaining a suitable yeast.

ACIDITY.

The acidity of wine is due partially to free tartaric and malic acids, but principally to bi-tartrate of potash. In unripe grapes the quantity of free tartaric acid is very high, and gradually decreases as they ripen. When grapes pass the point of complete maturity, the decrease of acidity generally continues, so that overripe grapes often contain less than the desired amount.

The use of plaster (gypsum) to augment the acidity of musts in France was efficacious in preventing the action of bacteria in wine. Since the suppression of the use of plaster for this purpose, bacterial troubles of wine have become much more common in France. Picking the grapes before they have reached maturity, when they contain larger amounts of malic and tartaric acids, or the addition of half-ripe grapes to grapes low in acid, has been found perfectly successful as far as concerns the protection of the wine from bacteria and from "sticking," or arrest of fermentation. It cannot, however, be recommended, even for low-grade wine, for the greenness and harshness of the wine thus made is very objectionable, and the production of fine wines is absolutely impossible by this means. The addition of tartaric acid to supplement the acidity of overripe grapes has been extensively practiced of late years in southern France. When done correctly, this addition is satisfactory in many cases, though in practice it has been found very expensive and often unreliable. The difficulty of ascertaining the exact acidity of his must and the correct amount of acid to be added is seriously in the way of the use of this method by the ordinary wine-maker. A sufficiently close approximation of the sugar contents of a must is easily accomplished by means of a saccharometer or specific gravity spindle, but all the instruments in use by wine-makers for the determination of acidity are very unreliable.

The principal use of high acidity in fermentation is not aid given to the alcoholic yeast, but prevention of the growth of bacteria. As a low temperature has exactly the same effect, and as it can be controlled with more certainty with the instruments available to the ordinary wine-maker, the use of cooling devices and probably of coolers or refrigerators is much to be preferred to the addition of tartaric acid.

The addition of tartaric acid is also very much more expensive, for, to raise the acidity of the must 0.05% would cost more than the cooling, and would hardly be enough to have any perceptible effect on the fermentation, though this is the proportion usually used in southern France. To raise the must 0.2% would cost at least $8 per 1,000 gallons, which for ordinary wines would be a serious expense. The addition of so much free tartaric acid would also be likely to give a sharp and harsh acidity to the wine.

The efficacy of low temperatures for this purpose is well exemplified by many of the fermentations of Tulare grapes made at this station. Grapes containing over 24% of sugar and less than 0.3% of total acidity (expressed as tartaric acid) have fermented through thoroughly, and without the slightest sign of the action of injurious ferments or bacteria. This is due to the smallness of the vats used and the cool and even climate of Berkeley, which have kept the fermenting mass from rising to a dangerous degree of temperature.

NITROGEN.

The presence of certain soluble nitrogenous matters is indispensable to the development of yeast. These usually occur in sufficient quantity in normal grape musts, in the form of proteid substances and amids. The amids are almost completely eliminated from the must by fermentation, and only traces are found in the wine. This has suggested the use of ammonium phosphate as an aid to fermentation. Experiments by Martinand seem to show that this salt is of use in cool fermentation, giving the yeast increased vigor, and enabling it to use up all the sugar in a must which would otherwise have remained sweet for a long time at low temperatures. The addition of peptone has been tried with somewhat similar results. At high temperatures these additions seem to have no effect, or, as in the case of peptone, are harmful on account of the aid given to the development of bacteria.

AERATION.

Aëration of the must or incompletely fermented wine has been practiced extensively in various ways. Its influence on yeast in a dormant state as it exists on the surface of grapes, or in the lees of fermented wine, is very marked. If yeast in a dormant or spore state be brought into a must which has been boiled or otherwise deprived of its dissolved free oxygen, it will fail to develop. As soon as the must is aërated and thus filled with oxygen, fermentation commences. As a rule, a must is aërated sufficiently during the process of crushing, but often a "stuck fermentation" can be revived by a thorough aëration. The usual methods of doing this affect the wine in two ways: they fill the wine with oxygen, and at the same time cool it. The lowering of temperature is of great benefit, though it is not always perceptible, for the experiments of Muntz and Rosseau show that it is almost always neutralized by the heat developed by the increased fermentation consequent on the addition of oxygen. Too much aëration of the fermenting liquid should be avoided, for it changes and precipitates the color and decreases the natural aroma of the grape. There is also a loss of alcohol by evaporation, which in some cases is very noticeable. But aëration of the must before fermentation is beneficial in another way. It renders insoluble and precipitates some of the albuminoid matters of the must, thus rendering the wine less liable to the attacks of bacteria, and more apt to clear rapidly.

INFLUENCE OF TEMPERATURE.

The deleterious effect of high temperature in the fermentation of red wines was well shown in the series of experiments made by Prof. Hilgard, and published in the Viticultural Report of this station in 1886. Judging, however, by the lack of effort made to regulate temperature in the vats of wineries, the serious import of these investigations is not yet thoroughly appreciated in California. To the undue elevation of temperature which takes place in the majority of cases all over California is to be ascribed nine tenths of the trouble to which our wines are subject.

Alcoholic fermentation—that is, the transformation of grape sugar into alcohol and carbonic acid under the influence of yeast—is a phenomenon of combustion, and is accompanied by the evolution of a definite amount of heat. Berthelot has shown that 180 grams of grape sugar in being transformed into alcohol and carbonic acid produce 71,000 calories. That is to say, if a must containing 20% of sugar be fermented dry, it will give out enough heat to raise its temperature 128° F., if all the heat were retained. Of course, this result is practically impossible, and does not occur, because under all circumstances the greater part of the heat is dissipated by radiation and the escape of the carbonic acid. Enough, however, is generally retained under the conditions of wine-making in California to raise the wine to a dangerously high temperature. The temperature, therefore, of the fermenting mass is equal to that of the grapes at crushing, plus that due to the heat evolved by the fermentation, and minus that lost by the radiation and evaporation. This shows the importance of the initial temperature of fermentation.

In every fermentation of wine there is generally a loss of about 1.5% of alcohol. That is to say, the alcohol produced, instead of being 48.5% of the sugar consumed, is only 47%. If the temperature of the fermenting mass is high, this loss may reach 3%. This is due, doubtless, to a great extent, to the simple evaporation which is favored by the high temperature, but also to the presence of sugar-destroying organisms.

If the temperature of grapes when crushed is low, the fermenting-vats small, and the outside temperature not too high, the heat of combustion will not be sufficient, in general, to raise the fermenting mass to a dangerous degree. If, however, the grapes are hot when crushed, unless some cooling device be employed, the temperature of the mass will almost certainly rise to a point which is dangerous and generally fatal to the yeast. Unless the grapes are very low in sugar-contents this point is reached before the wine is dry. The death of the yeast leaves the field open to the action of various kinds of bacteria, which are not injured by these high temperatures, and which live at the expense of the sugar remaining in the "stuck" wine. This is the starting-point for most of the diseases of wine. This "stuck" wine soon becomes the prey of lactic, acetic, tartaric, and butyric fermentations caused by bacteria, which form products giving mousy, sweet-sour, milk-sour tastes, and cause the wine to become flat, turbid, and impossible to clear. Though the vitality of the yeast is not destroyed at temperatures between 90° and 100° F., and under ordinary conditions is not killed at temperatures much below 110° F., for perfect assurance of a clean fermentation and good quality the temperature should never exceed 90° F. There are two main reasons for this: In the first place, though yeast cells are not killed at 95° F., this is not their optimum temperature, as it is approximately that of many kinds of bacteria. Thus, though the yeast is not killed, and may ferment the wine dry, it is partially paralyzed and the bacteria are able to develop side by side with it and leave their products of excretion to injure the aroma, flavor, and clearing quality of the wine, besides being a constant menace to its future health. In the second place, though the yeast is not killed, it is left in a diseased condition. The quality of a wine fermented at a high temperature is injured, not only by the flavors due to the presence of bacteria, but to the abnormal products of the diseased yeast. The high temperature, though it may not be sufficient to kill the yeast, injures its vitality and changes its form, as can be well seen

by a microscopic examination. Yeast thus injured excretes substances different from those excreted in its healthy and normal state, and which have a deleterious effect on the taste of the wine. According to L. Roos,* the "sweet-sour" wines so common in hot countries are the effect of this diseased condition of the yeast. The difficulty of refermenting these wines is due, according to this author, to the presence of enough of the products of the diseased yeast to render the wine sterile to healthy yeast. This condition is too common in California to need more extended description. The obvious remedy is to crush the grapes only when they are cool. In the early morning the temperature of the grapes is always lower than that of the air, even in warm seasons being generally below 65° F., and often much lower. As the sun appears, however, the average temperature of the grapes rises more rapidly than that of the air. In the middle of the day the temperature of the grapes is generally from 5° to 10° higher than that of the air. This means that when they enter the vat they will often exceed 90°. They thus start with a temperature higher than the optimum of alcoholic fermentation, and one very favorable to bacterial life. This insures a rapid increase of all the bacterial germs before the yeast germs have become active.

The rise of temperature during fermentation is, under the conditions usually existing in California, about 30° F.; that is to say, if the grapes are crushed at 60°, the temperature of the vat will rise to 90°. This is a very favorable view, for only too often, on account of the heat of the fermenting-room and the large size of the vats, the rise is much greater. If the grapes enter the vat at 70°, therefore the ordinary rise will bring them to a temperature injurious to the life of the yeast. If the initial temperature is greater than this, the corresponding rise is less, on account of the diminished activity or paralysis of the yeast and consequent cessation of the evolution of heat. The only difference will be that a grape which, if started at 70° F., would "stick" with 2% of sugar, will, if started at 80°, "stick" with 6% or 8%. If the grapes which are picked during the heat of the day are left in the boxes all night without being piled up, they will generally be cool enough in the morning. This method, however, is not always practicable on large vineyards, and even though the grapes are crushed cool, the temperature will often rise to a dangerous height if the fermenting-room is warm and the vats large. The use, then, of some cooling device seems to be the only sure and reliable method applicable to all conditions.

REFRIGERATORS, OR COOLING MACHINES.

The wine-makers of southern France and Algeria, who are confronted by the same difficulties as those which cause so much trouble and loss in California, have, after several years of trial and experience, reduced the method of cooling to a perfectly practical basis. The method is so successful and profitable that it has been adopted by a very large number of Algerian wine-makers, and seems destined to become universal there.

The use of a cooling coil placed in the vat, after the method used by brewers, has been tried, but with only partial success, on account of the hindrance to the free circulation of the wine, due to the cap of red

* Bulletin du Ministère de l'Agriculture; Paris, 1895.

wines. As it is in the thick cap where the highest temperature is reached, and where the most damage is caused, this method is altogether inefficient for fermentation of red wines. For white wines the method would be good but for the trouble and expense of applying it to wine in casks. Attempts have been made to utilize the cooling properties of compressed air and carbonic acid, but without success.

M. Toutée's metallic fermenting-vats are a step in advance. They are made of metal (on account of its value as a heat conductor), covered with some substance to protect it from the action of the acids in the wine. The vat is covered exteriorly with cloth, which is kept constantly wet. The evaporation from this cloth is the source of the cooling, and the vats are preferably exposed to the wind in order to increase the evaporation. This method gives perfect satisfaction in the fermenting of white wines, but with red wines the imperfect circulation of the wine, which rendered the use of internal coils inadequate, reduces very much its efficiency. The question of expense also makes it inapplicable to most cases, for it involves the substitution of new vats throughout the cellar. Instead of cooling the wine within the vat, attempts have been made to cool the wine outside and return it to the vat. Drawing the wine from the bottom and pumping it over on to the cap in a spray, and allowing the wine to run over a wide surface in a thin sheet exposed to a strong current of air, are some of the methods tried. The great objection to these methods is that they expose the wine too much to the air, injuring it by the evaporation of the alcohol and by liability to acetification. The cooling machines, or refrigerators, which are used extensively in Algeria now, are all made on one of two principles. One is essentially that of the water-bath, or "bain-marie." The wine is run into a receptacle, which is surrounded by a bath of cold water. It is left there until sufficiently cool, and then pumped back into the fermenting-vat. This method is too slow in operation for large cellars, though it might be useful where but little wine is made. The other principle, employing a cooling apparatus, which allows of continuous action, and is the one most successfully used, consists of a long tube, either straight or coiled, through which the wine is pumped, and which is cooled on the outside by water alone or by water and a current of air. Some modification of the ammonia coolers in use for cold storage and dairy purposes, would probably be the most efficacious that could be devised for large establishments where the requisite power is available, and where the large initial expense could be afforded.

During the vintage of 1894 in Algeria, M. Pirodon* treated over 130,000 gallons of wine with a single cooling machine. By its aid he deprived the fermenting wine of from 7 to 10 calories of heat; that is, on the average, he reduced the temperature about 15° F. The vintage lasted forty-four days, and the apparatus was used only at night, between the hours of 11 P. M. and sunrise the next morning. It consisted of twenty tubes, each 13 feet in length and nearly 2 inches in diameter, and had a capacity of a little over 500 gallons per hour. The heat lost by the wine was about equal to that gained by the water, the wine losing a little more on account of the cooling caused by the evaporation of the water on the pipes. No figures are given as to the cost of operation, but it is said to be very small.

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*See Bulletin Agricole de l'Algérie et de la Tunisie; 15 Juillet, 1895.

The practical and economic use of a cooling machine is thus demonstrated wherever a sufficient quantity of cool water is available. M. Pirodon's experience, however, shows more than this. On account of scarcity of water he was obliged to content himself with 10,000 gallons of water, collected before the vintage and used for the whole operation. In order to cool the water after using, he constructed a shallow reservoir, divided into four compartments, having a total exposed surface of about 800 square feet. Three of these compartments were filled with water to the depth of 8 inches. The other was left empty to receive the warm water coming from the machine. The three compartments held about 4,000 gallons, the other 6,000 gallons being kept in a tank to replace the water lost by evaporation. The warm water cooled in from two to four hours, according to the weather. When there was a dry wind the cooling was very rapid, and the water sank to several degrees below the temperature of the air. These results were obtained in a locality where the weather is usually very hot and moist; in a drier atmosphere the results would be even more striking. A more effective means of cooling the water after using, but one requiring a more expensive installation, is the "cheminée climagène" of M. Dessolliers. The essential parts of its construction are such that the water runs over a mass of hollow bricks exposed to a strong current of air. The bricks might be replaced by fagots of vine canes or similar material.

EXPERIMENTS WITH PURE AND SELECTED YEASTS.

Experiments with pure and selected yeasts were first made at this station in 1893 with some Johannisberg yeast brought directly from Germany by Mr. A. P. Hayne. Other experiments were made at the same time with *Botrytis cinerea*, the fungus known as "noble mold" (*Edelfäule* of the Germans and *Pourriture noble* of the French). For an account of this fungus and how to distinguish it from other molds, see page 451. More extended experiments were made during the season of 1895, with yeasts imported from M. Jacquemin of the Institut La Claire. The following notes include the results of experiments made in 1893 at the Station, of those made in 1895 at the cellars of wine-makers, and of the more extended experiments made at the Station in the same year. The analyses were all made by Mr. G. E. Colby.

RHINE-WINE YEAST AND BOTRYTIS CINEREA, OR NOBLE MOLD.

Experiment I. The grape used in this experiment was:

No. 1912, *Verdal*, from Tulare. Received October 6, 1893, in fairly good condition, just a trifle bruised, but no mold. The must showed 18.8% of solid contents by spindle and 0.75% of acid. The must was divided into three equal lots and fermented as follows:

No. 1912, ordinary fermentation;

No. 1912*a*, fermented with the addition of Rhine-wine yeast imported from Germany;

No. 1912*b*, fermented with the addition of some grapes which were covered with the spores of *Botrytis cinerea*.

The temperature of the must at crushing was 69° F., and the maxi-

mum, of 81° for No. 1912 and No. 1912*b*, and of 77° F. for No. 1912*a*, was reached on the second day. The wine fermented with German yeast progressed slowly and was not dry until the eighth day. The other two fermented more quickly, and were dry on the fourth day.

At three weeks they were all nearly clear, and were racked for the second time and taken to the cellar. At four months they were all tasted, with the following result:

No. 1912 (ordinary fermentation)—Bright, clean-tasting, no bouquet and little flavor, full acid.

No. 1912*a* (with German yeast)—Bright, clean-tasting, has a slight bouquet, and is smoother and more agreeable than No. 1912.

No. 1912*b* (with *Botrytis cinerea*)—Bright, clean-tasting, no bouquet and little flavor, full but rather green acid, not differing materially from No. 1912.

At eight months the wines showed about the same relative character. At ten months the normally fermented wine was a little more advanced than the others. The lees of all were examined under the microscope, and found to be perfectly sound.

At sixteen months there was little difference between the three samples, except that No. 1912*a* and No. 1912*b* (the treated wines) showed a little more character than the *witness* sample, but No. 1912*a*, the wine made with German yeast, was a little less advanced. Three months later all the wines were bottled. At two years and nine months all three were perfectly bright and with very little and well-settled deposit. They were light, clean-tasting wines of little character, but vinous and agreeable. There was little difference in taste, but No. 1912*a* had a fair bouquet, which was lacking in the others.

This experiment indicates the value of Rhine-wine ferments in moderating the violence of fermentation and increasing the bouquet in light musts. They also show that the presence of *Botrytis cinerea* is not harmful in the fermenting-vat. It does not seem to have any beneficial effect, but at the same time does not injure the flavor of the wine, as most other molds do. This is a point worthy of notice, as many tons of grapes were rejected in Napa Valley during the vintage of 1893 on account of the presence of this mold. That even grapes which are badly attacked by this mold are not rendered unfit for wine-making is well illustrated by the following experiment:

BOTRYTIS CINEREA.

Experiment II. No. 1929. Grapes very moldy, from *Botrytis cinerea*; from St. Helena, Napa County. The grapes when received were completely invaded by the mold, and looked like a mass of decayed grapes, stems, and mold, without a single sound berry. The mold was examined, and found to be *Botrytis cinerea*. There was no disagreeable moldy smell to the grapes, as there would have been had the mold been the common *Penicillium glaucum* (common blue mold). The must was pressed out of the grapes as they were, and fermented as white wine. It showed 27.6% of solid contents by spindle and 0.98% of acid. The temperature of the must at crushing was 68° F., and the maximum, reached the third day, was 74°. The must fermented very slowly, and at two months was still a little sweet, but bright and sound. Six weeks later it was still bright, a little sweet, quite sound, sharp-tasting on

account of its high acidity and dissolved carbonic gas, but quite clean-tasting and without any taste of mold. At seven months it was bright and sound, clean-tasting and with very little sweetness left, of marked aroma, and still charged with carbonic gas. Three months later it had changed little; it had the character of a wine made from concentrated must.

At sixteen months it was in good order and perfectly dry; it was not delicate, but sound, clean-tasting, fresh, and with good acid. Two months later it was bottled. In bottle it went through a slight fermentation, and when next examined at two years and four months it was a bright, sparkling wine, but with a distinct Sherry taste. As an experiment, it was slightly sweetened and fortified, and left loosely corked. Five months later it had developed into a very good Sherry of full aroma, clean taste, and marked character; its only defects being somewhat high acid and rather too much of the "rancio" taste.

The conclusion from these experiments is, that if the grapes are only slightly attacked by the Botrytis they may be allowed to enter the fermenting-vat with the sound grapes; if badly attacked, they had better be used separately, and probably will be found useful for Sherry-making. The following experiment is confirmatory of the above:

Experiment III. No. 1982, *Verdal* (*Napoleon*), from Tulare. Received October 25, 1893. The grapes were in good condition, and the must showed 19.3% of solid contents by spindle and 0.58% of acid. The must was divided into two lots: No. 1982, fermented normally, and No. 1982*a*, fermented with the addition of 1 gallon of must from No. 1929 to 11 gallons of the Verdal must. The must added was from the grapes from Napa, which were so badly affected by *Botrytis cinerea*. The two fermentations were perfectly similar, both as regards temperature and duration. There was no perceptible difference in the wines until they were about a year old, when the Botrytis-infected wine had slightly more flavor than the witness sample. At two years and nine months the wines had been in bottle for fourteen months. The untreated wine was bright, good, clean-tasting, agreeable, but neutral, and without bouquet. The wine which had received the addition of Botrytis was very similar, but was a little smoother and less fresh-tasting.

"JOHANNISBERG" YEAST.

Experiment IV. The following samples were taken for the experiment:

No. 2014, *White Vernaccia*, from Mission San José. Received October 26, 1893, in good condition. The must showed 24.8% of solid contents by spindle and 0.84% of acid.

No. 2015, *Peverella*, from Mission San José. Received October 26, 1893, in good condition. The must showed 23.1% of solid contents by spindle and 0.94% of acid.

The musts from the above two samples of grapes were blended in the ratio of 56% of White Vernaccia to 44% of Peverella. The blended must was divided into two lots—No. 2014–15, which was fermented in the ordinary way, and No. 2014–15*a*, which was fermented with the addition of "Johannisberg" yeast. There was no perceptible difference in the fermentation of the two lots; they both attained a

maximum temperature of 76°, and were dry on the ninth day. The wines were treated alike, and were both of good quality, but showed no marked difference until they were bottled at nineteen months. Seven months after bottling the wines were tasted. No. 2014–15 (normal fermentation) was bright, without deposit, much improved since bottling, and showing a little bouquet. It was smooth and more mature than No. 2014–15*a*, but a little flat. No. 2014–15*a* (German ferments) was also perfectly bright and without deposit, of distinctly higher bouquet, fresher taste, and in general of a higher quality than the witness sample. The difference of character at this time was very marked. Seven months later both wines were in good order, and had made no deposit in the bottles. The wine fermented normally was a little brownish in color, a little flat and lacking in bouquet, in general much inferior to the wine fermented with "Johannisberg" ferments, which was of a light yellowish-green, fresh and clean taste, some bouquet, and very agreeable flavor.

No. 2021. *Black Ferrara*, from Tulare. Received October 27, 1893, in good condition. The must showed 22.6% of solid contents by spindle and 0.64% of acid.

No. 2023. *Almeria*, from Tulare. Received October 27, 1893, in good condition. The must showed 19.7% of solid contents by spindle and 0.54% of acid.

The above two samples were blended in the proportion of 75% of Black Ferrara to 25% of Almeria. The must was divided into two lots, No. 2021–23, which was fermented in the ordinary way, and No. 2021–23*a*, which was fermented with the addition of German ferments. Both wines were dry on the fourth day and did not pass the temperature of 77° F. Both were treated alike, and no difference was noted until they were ten months old, when the wine fermented with German yeast was smoother and showed a little bouquet, which was quite lacking in the other. At eleven months both wines were bottled. At two years and nine months the normally fermented wine was nearly bright, but had made a considerable deposit in the bottle, was flat, tasteless, and had a disagreeable odor. The wine fermented with the addition of "Johannisberg" yeast had much less deposit, was cleaner-tasting, and though neutral was an agreeable wine, with some bouquet and flavor. As a blending wine the latter would be valuable, while the former could not be used except with the very commonest wines. This experiment is very interesting as showing the possibility of giving some quality, by the use of an appropriate selected yeast, to even the most characterless of grapes.

ANALYSES OF MUSTS AND WINES—EXPERIMENTAL FERMENTATIONS WITH YEASTS AND MOLDS IN 1893.

	Date of Picking	MUST.				WINE.			
		Solid Contents by Spindle	Sugar by Copper Test	Acid as Tartaric	Ash	Alcohol. By Weight	Alcohol. By Volume	Total Acid as Tartaric. Six Months	Body
No. 1912. Verdal, ordinary fermentation	Oct. 4, 1893	18.80	17.70	.75	.39	7.43	9.27	.53	2.6
No. 1912*a*. Verdal, with Johannisberg yeast	Oct. 4, 1893	18.80	17.70	.75	.39	7.30	9.09	.48	2.3
No. 1912*b*. Verdal, with *Botrytis cinerea*	Oct. 4, 1893	18.80	17.70	.75	.39	7.36	9.18	.56	2.3
No. 1929. Moldy grapes (Zinfandel?) from St. Helena	Oct 12, 1893	27.60	26.31	.98	----	11.85	14.50	.96	3.8
No. 1982. Verdal (Napoleon), ordinary fermentation	Oct. 18, 1893	19.30	18.46	.58	.25	7.64	9.54	.44	2.6
No. 1982*a*. Verdal (Napoleon), with *Botrytis cinerea*	Oct. 18, 1893	19.30	18.46	.58	.25	8.34	10.42	.45	2.6
No. 2014. Vernaccia } blended	Oct. 24, 1893	24.80	23.80	.84	.32	*9.70	12.09	.67	2.8
No. 2015. Peverella } blended	Oct. 24, 1893	23.15	21.22	.91	.23	†9.78	12.20	.71	2.4
No. 2021. Black Ferrara } blended	Oct. 26, 1893	22.60	21.63	.64	.32	----	----	----	----
No. 2023. Almeria } blended	Oct. 26, 1893	19.70	19.20	.54	.41	‡8.13	10.17	.44	2.5

*No. 2014-2015, ordinary fermentation. †No. 2014-2015*a*, with Johannisberg yeast. ‡No. 2021-2023*a*, with Johannisberg yeast.

FURTHER EXPERIMENTS WITH SELECTED YEASTS.

In July, 1895, the following pure and selected yeasts were received from George Jacquemin of the "Institut La Claire," Le Locle, Doubs, France: Medoc, Burgundy, Chianti, Sauterne, Johannisberg, Algerian (for high temperatures).

A quarter-liter bottle of each was received. They were put up by Jacquemin's special method, which is guaranteed to keep them in good condition for at least six months. On September 10th a number of Sternberg flasks were filled from each bottle. Some of each of these were used to innoculate small flasks of sterilized must, and the rest kept in reserve. Needless to say, all necessary precautions were taken to avoid contamination from foreign spores. The Algerian, Burgundy, and Johannisberg yeasts fermented within two days when kept at a temperature of 77° to 82° F. The rest were then aërated, and the Bordeaux started at the end of nine days. The Sauterne and Chianti yeasts failed to develop. When the small flasks (100 c.c.) were in full fermentation the contents of each were poured into a three-liter flask of sterilized must. These three-liter flasks were then sent to various wine-makers for experiment, accompanied by the following circular explaining the method of use:

DIRECTIONS FOR USING PURE YEAST.

(For 1,000 gallons of wine.)

1. Take four boxes (200 lbs. at least) of good, sound, freshly picked grapes. The grapes should be picked while cool. Wash them thoroughly with a stream of water. Crush them into a tub and strain off the must into a small keg.

2. Mix the contents of two flasks with the must, and allow to stand for 48 hours in a warm place (between 70° and 80° F.)

3. (*a*) For white wine: Pour the contents of the keg into the fermenting-cask, or a proportionate part into each of the casks if smaller cooperage is used, and then put in the must to be fermented.

(*b*) For red wine: Pour one sixth of the contents of the keg on to the bottom of the fermenting-vat, and then put in the rest gradually as the vat is filled, being careful to distribute it as thoroughly and equally as possible, and finally give the whole a good stirring.

4. Make a parallel experiment without using the pure yeast, under as nearly as possible similar conditions, by fermenting the same amount of the same grapes in a cask or vat of the same size. Keep the wines separate for as long a time as practicable for comparison.

CAUTION! Every utensil used in the preparation of the yeast—boxes, tubs, buckets, stirrers, etc.—must be thoroughly cleaned with boiling water immediately before use.

N. B.—It is important that all these directions should be minutely followed.

EXPERIMENTS BY WINE-MAKERS.

Fourteen samples of yeast were sent out to various wine-makers, but only seven were reported on. The results so far obtained are as follows:

Experiment I. One flask of Johannisberg yeast was sent to W. S. Keyes, Howell Mountain, St. Helena, Napa County, on October 4, 1895. The report from Mr. Hume, the cellarman, was as follows: "Two puncheons were filled on October 5th with must from Johannisberg Riesling. The must showed 24% of solid contents by the saccharometer, and a temperature of 64°. To one puncheon the yeast was added, and the other was allowed to ferment spontaneously as a witness. Fermentation in the treated puncheon was very perceptible on the evening of the following day. On the sixth day it was very active, and the temperature had risen to 85°. The saccharometer showed 7%. After this the fermentation became slower, and the temperature fell. At ten days

the fermentation was very slow, and the saccharometer showed 4%, the thermometer 67° F." On June 16, 1896, samples of this wine and of the witness were received at the laboratory, and analyzed, with these results:

JOHANNISBERG RIESLING.	Alcohol.		Acid as Tartaric.	Solids.	Sugar.
	By Weight.	By Volume.			
Wine with Johannisberg yeast	9.92	12.36	.55	7.00	3.88
Wine without added yeast	12.54	15.40	.41	2.30	Dry.

The wine fermented without the addition of yeast was clear, dry, slightly astringent, clean-tasting, and of very marked aroma. The wine fermented with Johannisberg yeast was equally clear, of equal or better aroma, quite clean-tasting, and smoother than the other; it was still very sweet, and smelled slightly of sulphur. Its lees showed an abundance of yeast of rounder outline than the usual California yeast. The lees of the witness showed little yeast.

Experiment II. Two flasks of Johannisberg yeast were sent to K. Dresel, Sonoma, in October, 1895. On June 20, 1896, two samples of Traminer wine were received at the station, one fermented with yeast and one without. They were analyzed, with the following results:

TRAMINER.	Alcohol by Volume.	Acid.	Body.
With yeast	13.75	.44	2.1
Without yeast	15.00	.53	2.3

The wine fermented in the usual way was cloudy, of strong, characteristic aroma, full flavor, but not quite clean-tasting, and slightly bitter. That fermented with Johannisberg yeast differed little from the other, but was slightly more bitter. The lees of both wines, examined microscopically, showed abundance of bacteria.

Experiment III. Two flasks of Johannisberg yeast were sent to Beringer Bros., St. Helena, Napa County, on September 23, 1895. On June 19, 1896, two samples of Burger were received from the above firm; one fermented with the addition of yeast, and the other without. Analysis gave these results:

BURGER.	Alcohol by Volume.	Acid as Tartaric.	Body.
With yeast	11.50	.502	2.1
Without yeast	11.60	.577	2.3

The wine fermented in the ordinary way was cloudy, with little flavor or aroma, and with sharp, unpleasant acid. That fermented with Johannisberg yeast was nearly clear, with some aroma, clean taste, and smoother acidity than the witness. The wines examined microscop-

ically showed very few yeast cells. The sediment of the treated wine was nearly pure, but that of the witness showed a few bacteria.

In these three experiments we have apparently two failures and one success. The reason is not far to seek, and teaches an important lesson, viz., that our yeast must be carefully chosen in accordance with the suitableness of its characteristics to the object in view, and of the conditions of environment in which we place it. The Johannisberg yeast is evidently unsuited to musts with high sugar contents, as might be expected.

In Mr. Keyes's experiment the fermentation was arrested when the must contained 12.36% of alcohol by volume and 3.88% of sugar, while the witness fermented dry with 15.4% of alcohol. At the time of analysis the treated wine was still fermenting, probably in consequence of the small amount of native yeast it contained mixed with the Johannisberg. The high amount of alcohol attained by the witness shows the power of the native yeast of eliminating large quantities of sugar and resisting the antiseptic action of alcohol. It is beyond doubt much more suited to the fermentation of such heavy musts than the Johannisberg ferment, and if such musts are to be fermented, a selected native yeast would doubtless be as good or better than any other. The "stuck" wine exhibited no sign of unsoundness, thus showing a very pure fermentation. There were no bacteria present, thus proving that the trouble was simply the inability of the yeast to break up so much sugar. The use of a yeast like this would be worthy of trial in the production of wines, such as Sherries or sweet Sauternes, in which it is intended to retain a certain amount of unfermented sugar.

In the case of Mr. Dresel's wines it is doubtful if the musts had the same amount of sugar originally. They show that the addition of pure yeast did not prevent the action of bacteria, though it might have done so in a lighter must.

In the Beringer Bros.' Burger must the Johannisberg yeast was evidently at home, and the result was an unqualified success. The must was light in sugar and body, and with full acid, and the superiority of the wine fermented with Johannisberg yeast was very marked. There was seemingly not the increase in alcohol that is claimed as a consequence of the use of pure yeasts, but in the absence of an analysis of the original musts this cannot be determined with certainty.

Experiment IV. On September 30, 1895, flasks of Burgundy and of Algerian yeasts were sent to the Swiss-Italian Colony, Asti, Sonoma County, Cal. A 3,000-gallon vat of Zinfandel was fermented with each kind, and a parallel vat without addition. The must was analyzed on October 9, 1895, and the wine on May 25, 1896, with the following results:

ZINFANDEL.	MUST.		WINE.						
	Solid Contents by Spindle	Acid as Tartaric	Alcohol by Volume	Acid as Tartaric	Tannin	Body	Sugar	Color	
A. Witness			13.00	.64	.328	3.20	.46	5VR	25.5
B. Burgundy yeast	23.91	.82	13.50	.56	.240	4.10	1.00	4VR	22.6
C. Algerian yeast	22.23	.84	13.50	.51	.240	5.70	2.24	4VR	25.2

A. Zinfandel, fermented in the usual way. Nearly dry, with high acid and astringency. Its aroma was not so good as that of B and C.

B. Zinfandel, fermented with Burgundy yeast. Nearly clear, with better aroma and less acid than A; very astringent and still sweet; mellower and cleaner-tasting than A.

C. Zinfandel, fermented with Algerian yeast. Nearly clear; best aroma of the three, but contains a good deal of sugar; a full, mellow wine, which would be of excellent quality if dry.

Experiment V. Two flasks of Burgundy yeast were sent to H. Lefranc, San José, on October 2, 1895. The following careful notes of the fermentation were taken by Mr. Lefranc:

"On October 8th, at 5 P. M., we took six cases (240 pounds) of Mataro and Grenache, gathered in the cool of the morning, carefully picked them over, and then turned on the hose and washed them thoroughly, removing all foreign or dry matter. Then we placed, say a case of grapes at a time in a steamed tub, and a man stepped in with clean rubber boots and tramped the juice out, placed the strained juice (9 gallons) in a steamed 10-gallon keg, and then added the contents of the two decanters of yeast, well blending the whole. We then placed the keg, with the bung inverted, on two scantlings over the top of a fermenting-vat. Temperature of the vat, 70° F.

"October 10th, at 2 P. M., the blend commenced to ferment out of the keg, so we placed the liquid in a half-barrel. Temperature of the liquid ('levure'), 72° F.

"October 10th, at 5 P. M., we crushed in each vat about two tons, or two loads of grapes, picked that afternoon. Before crushing I placed about three quarters of a gallon of the liquid over the bottom of the treated vat, and then, on the morning of October 11th, at 7 o'clock, we continued to fill both tanks with grapes picked the same morning, alternating a load in each vat. At the same time I added three fourths of a gallon of the liquid to each load of grapes that we crushed into the vat, until I had used up the liquid in that one vat. I then had the man practice a severe foulage, first in the tank without levure, and afterward in the vat with levure. I then tested the must in the two vats, and found 24% of sugar, and temperature 68° F. I immediately placed on a false head, and after securing the same I had about 100 gallons of freshly pressed press-wine pumped on top so as to cover the false head, as is my custom with all my tanks of fresh must.

"On Saturday afternoon, October 12th, the temperature of the 'non-levured' tank was 75° F., and of the 'levured,' 77° F. I would have judged from superficial appearances that the 'levured' vat was one day older, otherwise both were alike.

"On Monday, October 14th, I removed the false head of both vats and gave another foulage, and on Tuesday allowed both tanks to run separately into 1,000-gallon oak storage casks. These vats each gave about 1,100 gallons of wine, not including the pressings. Your dose was for 1,000 gallons.

"The grapes used for both tanks were good, sound grapes, in the following proportions: ½ Carignane, ⅓ Mataro, and ⅙ Grenache."

On November 5, 1895, samples of the wine experimented on were received from Mr. Lefranc, and analyzed, with the following results:

BLEND.	Alcohol by Volume.	Acid as Tartaric.	Solids.	Sugar.	Color.	
With yeast	13.25	.54	5.10	1.68	1VR	40.00
Without yeast	13.25	.53	2.84	.....	1VR	34.80

The wine fermented without the addition of yeast was clear and of good aroma, dry, and very astringent. That with yeast was also clear, but not quite dry, and with less aroma, but quite sound.

Samples of the same wine were received on December 16, 1895, and analyzed, as follows:

BLEND.	Alcohol by Volume.	Acid as Tartaric.	Tannin.	Solids.	Color.	
With yeast	13.60	.67	.282	2.95	VR	35.7
Without yeast	14.10	.52	.266	2.70	VR	33.9

The wine with added yeast was not quite clear, and was mellower than the other. Otherwise there was little difference: they were both of good flavor, color, and body, medium acid and full astringency.

Experiment VI. Two flasks of Burgundy yeast were sent to the Fountain Grove Vineyard, Santa Rosa, Sonoma County, California, on October 7, 1895. The yeast was used to ferment a vat of Mataro, according to the directions which were sent with it. Samples of the wine were tasted on May 17, 1896. The wine to which yeast had been added was smoother, fuller, but less developed, and with less bouquet than the witness. The acidity of the treated wine was smoother and more agreeable. Samples of the treated and the untreated wine were received June 15, 1896, and analyzed, as follows:

MATARO.	Alcohol by Volume.	Acid as Tartaric.	Tannin.	Solids.
With yeast	12.36	.577	.259	2.85
Without yeast	13.09	.540	.252	3.20

Both wines were examined microscopically, and found to be normal.

These three experiments with Burgundy yeast show fairly concordant results. The effect seems generally to be to make the wine rounder and smoother, but of slower development. The Burgundy yeast, like the Johannisberg, seems inferior to the native California yeast in eliminating sugar from heavy musts.

EXPERIMENTS AT THE VITICULTURAL LABORATORY AND CELLAR.

Experiment I. On September 26, 1895, a blend was made of Mourastel 36%, Grenache 33%, and Petit Bouschet 31%. The grapes were from Tulare, and were mature and in good condition. The blended grapes were divided into three lots:

No. 2424–26. Crushed and fermented in the usual way.

No. 2424–26*a*. The grapes were dipped in sulphured water, hosed off, and then crushed after allowing them to drain a short time on a screen.

As the crushed grapes were put in the vat, three liters of Algerian yeast was added gradually.

No. 2424–26*b*. Treated in the same way as No. 2424–26*a*, except that Bordeaux yeast was employed instead of Algerian.

The wine fermented in the ordinary way reached its maximum temperature of 97.5° F. on the fourth day, and was drawn off on the fifth, while still a little sweet. That with Algerian yeast reached its maximum temperature of 97° F. on the third day, and was dry on the fourth, when it was drawn off. The observations of the fermentation of the Bordeaux vat were identical with those of the Algerian. In nine days the witness was still cloudy, while the other two were nearly clear. Ten days later the witness was still cloudy, with flat taste, little aroma, and much inferior to the other two. The wine fermented with Algerian yeast was quite clear, with good aroma and clean taste. The Bordeaux was the best of the three; it had less aroma than the Algerian, but was more delicate. The latter two wines were racked and taken to the cellar at this time. The witness was left in the fermenting-room for two weeks longer, when it was racked also and taken to the cellar, though still not quite clear. At two months the witness had improved; it was clear, though not so bright as the others nor so clean-tasting, and possessed of less aroma. There was little difference between the other two, though No. 2424–26*b* (Bordeaux) was still a little more delicate. At five and a half months the witness was not so clear as the Algerian and Bordeaux, and tasted bitter. The Algerian had improved most of all, and, though differing little from the Bordeaux, showed more aroma. Four months later the Algerian was still the best of the series; it showed excellent aroma and was smoother and more agreeable than either of the others.

Experiment II. A blend was made consisting of 35% Black Prince, 15% Mission, 20% Moretto, 10% Tinta Amarella, 10% Tinta Câo, and 10% Mourisco Preto. The blended grapes, which came from the Tulare station, were divided into two lots:

No. 2448–53. Fermented in the ordinary way.

No. 2448–53*a*. Fermented with Algerian yeast. The grapes were dipped in sulphur water and washed, as in No. 2424–26*a*.

The witness attained a maximum temperature of 84° F. on the fourth day, and was pressed and fortified on the fifth. The Algerian yeast vat attained a maximum of 88° F. on the third day, and the wine was drawn off and fortified on the fourth. At six weeks both wines were clear and differed little, except that the witness had a slight taste of mousiness. On April 1st both wines were put in the heating-chamber for three months, at a temperature of 95° F. On July 18th, when the wines were nine months old, the witness was much superior to the wine fermented with Algerian yeast. It was nearly clear, of strong Port aroma and flavor, a Port of marked character, but somewhat coarse. The treated wine had much less of the Port character.

Experiment III. Nos. 2462–64 and 2462–64*a* consisted of 40% Carignane, 40% Aramon, and 20% Tinta Valdepeñas. The former was fermented with Bordeaux yeast and the latter with Algerian. The grapes were grown at the Tulare station. Somewhat less yeast was added to the Bordeaux fermentation than to the other. It attained a maximum temperature of 89.5° F. on the fourth day, when it was drawn off nearly dry. The Algerian fermentation attained a maximum temperature of

93° F. on the third day, and was drawn off very nearly dry on the fourth. Eight days later both wines were still cloudy, but the Bordeaux least so; it also had more aroma and tasted better than the Algerian. At twenty-five days from crushing they were both quite clear, and were racked off and taken to the cellar.

A month later the wines were bright; the Algerian was less advanced, of less agreeable flavor, but more marked aroma than the Bordeaux. At five months the Bordeaux was bright, very fresh and agreeable, had developed very quickly, showed good flavor and some bouquet, clean, fresh acid, and moderate astringency. The Algerian was a very good wine, tasted fuller and rounder than the Bordeaux, but had less bouquet. They were both good, clean-tasting wines, which had developed quickly. The blend would have been better with a little more of the Tinta.

Four months later the Bordeaux was in good order; it had good bouquet and was more astringent and more developed than the Algerian. The Algerian was smoother and of rather better tint than the Bordeaux. The wines differed in character, but were about equal in quality.

Experiment IV. Nos. 2472–74 and 2472–74*a* were blends of Palomino 35%, Beba 25%, and Malmsey 40%. The grapes came from the Tulare station, and were in good condition and well matured for sweet-wine purposes. No. 2472–74 was dipped and washed in the same way as in former experiments, and fermented with Algerian yeast. The other was fermented in the ordinary way. The vat with added yeast started more promptly and only attained a maximum temperature of 83.5° F., 1° lower than that attained by the witness. On the fourth day they were both fortified. At six weeks the wine fermented with Algerian yeast was clear, clean-tasting, and just sweet enough. The witness differed little, except that it was not quite so clean-tasting. At six months they were both racked for the second time, and put in the heating-chamber, at a temperature of 95°, for three months. Three weeks after taking from the heating-chamber the witness was nearly bright, of full aroma and good flavor, but bitter and still very raw. The Algerian wine was brighter, smoother, and cleaner-tasting, and it showed only the slightest bitterness, much less than the witness. It had rather less character, but was superior in every other way.

Experiment V. Nos. 2477–84 and 2477–84*a* were blends of Gros Mansenc 14%, Mondeuse 30%, St. Macaire 13%, Refosco 15%, Affenthaler 16%, and Carignane 12%. The grapes were from Mission San José and were all in good condition and mature, with the exception of the Gros Mansenc, which was a little green. The blended grapes were divided into two lots: No. 2477–84, treated as in former experiments and fermented with Burgundy yeast, and No. 2477–84*a*, fermented in the ordinary way. The treated wine attained its maximum temperature of 92.5° F. on the second day, and was drawn off on the third while still a little sweet. It was left in the fermenting-room, and was dry the next day. The witness attained its maximum of 96° F. on the third day, and was drawn off on the fourth while still a little sweet. Ten days after crushing the treated wine was dry and nearly clear; the witness was dry but cloudy. At eighteen days they were both clear, and were racked and taken to the cellar. At six weeks the treated wine was bright, of very distinct aroma and flavor, differing considerably from the witness, which, however, tasted more advanced in its development. At five months the witness was bright and in good condition, in general a good wine. The

treated wine was bright, full, and round, and with rather more aroma than the witness. Four months later both wines were very good, but the treated wine still showed more character.

Experiment VI. No. 2531, Aramon, from Mission San José. Received October 16, 1896, in good condition. The grapes were very fine and well ripened, though not very sweet. The grapes were not washed, but were fermented with the addition of Algerian yeast. The maximum temperature, reached on the third day, was 93° F., and on the next day the wine was dry and was drawn off. At eleven days the wine was not quite clear, but was of good flavor, astringency, and acid. Ten days later it was still not quite clear or quite dry, but was of good flavor. At five months it was bright, of good color and aroma, full flavor, a very agreeable wine. It had developed with remarkable quickness, and was already a drinkable wine. Four months later it was still good and had developed some bouquet. It was one of the best light red wines made from grapes from Mission San José. Its color was light but sufficient, and of good tint. It had a good, agreeable acid, full astringency, and clean after-taste.

ANALYSES OF WINES MADE IN EXPERIMENTAL FERMENTATIONS WITH PURE YEASTS.

VARIETIES USED.		Date of Picking.	MUST. Solid Contents by Spindle.	Sugar by Copper Test.	Acid as Tartaric.	Ash.
Experiment I.						
No. 2424. Mourastel, from Tulare	Blended.	Sept. 24, 1895	22.10	20.60	.85	.30
No. 2425. Grenache, from Tulare	Blended.	Sept. 24, 1895	24.45	23.13	.50	.25
No. 2426. Petit Bouschet, from Tulare	Blended.	Sept. 24, 1895	22.50	20.99	.68	.27
Experiment II.						
No. 2448. Black Prince, from Tulare	Blended.	Sept. 28, 1895	24.10	23.42	.38	.47
No. 2449. Mission, from Tulare	Blended.	Sept. 28, 1895	24.50	23.42	.53	.44
No. 2450. Moretto, from Tulare	Blended.	Sept. 28, 1895	23.10	22.23	.83	.40
No. 2451. Tinta Amarella, from Tulare	Blended.	Sept. 28, 1895	23.90	22.31	.58	.47
No. 2452. Tinta Cão, from Tulare	Blended.	Sept. 28, 1895	23.70	21.80	.51	.45
No. 2453. Mourisco Preto, from Tulare	Blended.	Sept. 28, 1885	23.70	22.23	.50	.44
Experiment III.						
No. 2462. Carignane, from Tulare	Blended.	Oct. 1, 1895	21.90	21.07	.64	.40
No. 2463. Aramon, from Tulare	Blended.	Oct. 1, 1895	18.60	17.70	.75	.40
No. 2464. Tinta Valdepeñas, from Tulare	Blended.	Oct. 1, 1895	27.15	26.00	.38	.43
Experiment IV.						
No. 2472. Palomino, from Tulare	Blended.	Oct. 6, 1895	23.20	22.23	.35	.43
No. 2473. Malmsey, from Tulare	Blended.	Oct. 6, 1895	22.60	21.38	.38	.47
No. 2474. Beba, from Tulare	Blended.	Oct. 6, 1895	24.10	23.13	.33	.41
Experiment V.						
No. 2477. Carignane, from Mission San José	Blended.	Oct. 8, 1895	25.60	24.64	.90	.29
No. 2480. Affenthaler, from Mission San José	Blended.	Oct. 8, 1895	23.70	22.95	.75	.30
No. 2481. Refosco, from Mission San José	Blended.	Oct. 8, 1895	25.65	24.64	.55	.31
No. 2482. St. Macaire, from Mission San José	Blended.	Oct. 8, 1895	25.90	24.64	.81	.27
No. 2483. Gros Mansenc, from Mis'n San José	Blended.	Oct. 8, 1895	22.40	20.83	1.26	.34
No. 2484. Mondeuse, from Mission San José	Blended.	Oct. 8, 1895	23.70	22.23	.65	.26
No. 2477-84. Blend			21.70	.....	.75	.....
No. 2477-84*a*. Blend			23.70†	.....	.81	.....
Experiment VI.						
No. 2531.* Aramon, from Mission San José		Oct. 14, 1895	22.40	20.54	.64	.32

* Fortified. † Diluted after analysis, see record.

ANALYSES OF WINES MADE IN EXPERIMENTAL FERMENTATIONS WITH PURE YEASTS—Continued.

Blends.	FERMENT USED.	WINE.					
		Alcohol.		Tannin.	Total Acid as Tartaric.		Body.
		By Weight.	By Volume.		At Pressing.	At Five Months.	
	Experiment I.						
No. 2424–26	Ordinary fermentation	8.82	11.00	.175	.59	.49	2.60
No. 2424–26*a*	Algerian yeast	8.82	11.00	.174	.65	.49	2.90
No. 2424–26*b*	Bordeaux yeast	8.82	11.00	.178	.58	.48	2.60
	Experiment II.						
*No. 2448–53	Ordinary fermentation	.....	17.60	.126	.48	.60	2.95
*No. 2448–53*a*	Algerian yeast	.....	17.00	.116	.56	.46	3.10
	Experiment III.						
No. 2462–64	Bordeaux yeast	8.45	10.50	.186	.63	.59	3.10
No. 2462–64*a*	Algerian yeast	8.53	10.60	.166	.60	.61	3.30
	Experiment IV.						
*No. 2472–74	Algerian yeast	.....	18.50	.....	.....	.33	2.60
*No. 2472–74*a*	Ordinary fermentation	.....	17.50	.....	.....	.25	2.10
	Experiment V.						
No. 2477–84	Burgundy yeast	8.70	10 80	.225	.88	.71	2.60
No. 2477–84*a*	Ordinary fermentation	8.53	10.60	.255	.75	.67	3.40
	Experiment VI.						
No. 2531	Algerian yeast	8.74	10.91	.209	.68	.65	2.80

*Fortified.

GENERAL CONCLUSIONS.

Amount of Alcohol Produced.—By looking at the table of analyses of the wines made at Berkeley, it may be seen that the amount of alcohol produced falls considerably below what might have been expected from the sugar contents of the musts. This is accounted for by the water which adhered to the grapes in dipping. The dipping and washing which the grapes underwent reduced the sugar contents just 2%. As the conditions of the experiments precluded the dipping of the grapes intended for witness tests, sufficient water was added to these to reduce them in the same proportion.

There is no indication of the production of a greater amount of alcohol by the pure ferments, such as is claimed for them by some European investigators. In fact, in the wines made at the cellars of wine-makers the reverse seems, at first glance, to be true. This, however, can be accounted for by the unsuitableness of the yeast employed, by the heavy musts, and by the high temperatures which obtain in most cellars, and does not in any way indicate a loss of alcohol or waste of raw material by the pure yeast. Owing to the difficulty of obtaining exact data regarding the chemical composition of the must, and of perfectly controlling the conditions in large-scale experiments, it would be unwise to draw any conclusion with regard to this part of the question without a considerable number of further trials.

Temperature of Fermentation.—In the Berkeley experiments the wines which were started with yeast commenced to ferment directly, became dry more quickly than those fermented spontaneously, and in most cases did not attain so high a temperature. Apparently, these results in some ways contradict those obtained at the vineyards. But it is to be noted, as remarked before with regard to the formation of alcohol, that the conditions of experiment are somewhat different in the two cases. At Berkeley the coolness of the atmosphere and the smallness of the vats are conducive to cool fermentation. At the vineyards the conditions almost always insure hot fermentations. In looking only at the results from the large-scale experiments, it would be natural to suppose that the addition of yeast had caused a sudden and violent fermentation which had raised the temperature above the critical point, thus causing the wine to "stick." Taking into consideration, however, the experiments at Berkeley, it seems more probable that, instead of increasing the temperature, these selected yeasts fail to produce as much heat as the natural ferments; but being less at home in the heavy musts and at the high temperatures of most Californian vintages, they are more quickly paralyzed, and thus fail to make their wines as dry as those fermented in the ordinary way. This by no means condemns them as unsuitable for our uses, but shows that, except in special cases, they cannot be used without the coöperation of some cooling device and probably the reduction of the high sugar contents of the must by some suitable means.

Improvement of the Wine.—As to the improvement of the wine by the use of pure yeast, it is to be noted that in every one of the experiments at Berkeley the wines fermented with the addition of yeast were cleaner and fresher-tasting than those allowed to ferment with whatever yeasts happened to exist on the grapes. The difference was in some cases not very marked at first, especially in the earlier experiments, where the precaution of washing the grapes was not taken. The difference in these earlier wines, however, though slight at first, increased as the wines advanced in age. The difference in the wines made in 1895, on the contrary, was in most cases very marked from the beginning. The promptness with which fermentation commenced, and the short time in which it finished, prevented the development of any large number of injurious ferments, while the rapid clearing made it possible to rack the wine early and thus remove it from the influence of what injurious micro-organisms did exist in the lees before the taste was affected.

The Burger wine, made by Beringer Bros., shows how the same result may be obtained with light musts on the ordinary industrial scale. How much of this improvement is due simply to the addition of yeast, and how much to the particular kind of yeast added, it is impossible to say at present. Doubtless a large part of it is to be accounted for by the promptness of the fermentation, precluding the development of injurious ferments, though the experiments show also that there do exist marked differences between the products of the various yeasts used.

For sweet wines the ordinary yeast spontaneously developed from the grapes themselves seems better adapted than the Algerian yeast to bring out the strong characteristics of Ports and Sherries. This is doubtless equally true of the other yeasts tried, though no direct experiments were made with them for this purpose. However, in all cases the pure yeast

produced the cleanest-tasting wines, though somewhat lacking in character. When the difference is slight, as in Nos. 2448–53 and 2448–53*a*, it does not make up for the lack of character, for the heavy, somewhat coarse character and rancio flavor of sweet wines disguise a slight deficiency in cleanness of taste. Where the difference is great, however, as in Nos. 2472–74 and 2472–74*a*, the undesirable tastes of the witness make the smoother and cleaner-tasting Algerian wine more desirable, in spite of its comparative lack of character.

Summary of Conclusions.—To sum up the conclusions that may fairly be drawn from the experiments made so far, the merits of the use of pure yeast are the following:

A quicker fermentation;

A more prompt clearing;

A cleaner taste, due to the overslaughing of injurious ferments;

And probably an improvement in flavor and bouquet.

It must not be forgotten, however, that these advantages can be obtained only if a yeast appropriate to the conditions is used; and the indications are that in many cases the use of a pure California yeast will be preferable to any other. This, however, is a matter for future investigation.

FERMENTATION AT HIGH TEMPERATURES AND WITH THE ADDITION OF VARIOUS SUBSTANCES.

Among the methods recommended and tried for the prevention of defective fermentations in hot climates, additions of certain substances to the must is perhaps the most common. These additions are made on one of three principles: (1) To render the must unsuitable to the growth of injurious organisms; (2) to increase the development of the yeast by making the must more favorable to its growth, and thus overslaughing the injurious ferments; and, (3) to keep the temperature of the must below the optimum for injurious ferments, by retarding the rapid development of the yeast.

In the first category are the addition of plaster, tartaric acid, unripe grapes; in the second, the addition of ammonium phosphate, peptone; in the third, the addition of sulphurous acid, sulphites, asaprol. The experiments described below were made in order to test the relative and absolute value of these various additions. The first two experiments were made to compare the effect of defective fermentation due to high temperature in dry and in fortified wines.

FERMENTATION AT HIGH TEMPERATURES.

(*a*) *Dry Wine.*—No. 858, Pinot Chardonay, from Mission San José. The grapes were in good condition, and yielded a must containing 24.24% of sugar and 0.48% of acid. In order to test the effect of the high temperature, which often exists in cellars in the hotter portions of the State, the must was put, immediately after pressing, into a room kept at a temperature of 93°. The wine fermented through, but showed the effect of bad fermentation. The wine was treated to the usual number of rackings, but deteriorated rapidly and was soon quite spoiled.

(*b*) *Sweet Wine.*—No. 1203, Verdelho, from Fresno. (See general record, page 319.) The grapes were in excellent condition, and showed 24.1% of solid contents by spindle and 0.65% of acid. They were fermented in a hot room at a temperature varying between 91° and 98° F., in order to test the effect of high outside temperature. The must at crushing showed a temperature of 69° F. It soon rose to 89° F., and remained at 88° to 89° throughout the experiment. The must fermented strongly for six days, when it gave unmistakable evidence of being "stuck." On the eighth day the wine was still very sweet and giving but slight signs of fermentation. In order to avoid too much contact with the air, it was racked into a smaller keg. On the next day fermentation had almost stopped, and 3 pro mille of *ammonium phosphate* was added. A day later the fermentation had revived, and continued for two or three days. At the end of twenty days the wine had a suspicious taste, and the lees showed abundance of bacteria. Six days later it tasted worse, and bacteria could be found all through the wine. The wine still showed 9% of solid contents. It was fortified to 14% of alcohol. Three months later it was racked for the third time, and refortified to 18.2% of alcohol. After fortifying the second time the wine showed 7.56% of solids, of which 4.60% was sugar. The wine was at first of very poor quality, and tasted of mousiness and bad acids. However, unlike No. 858 above, it gradually improved and lost nearly all of its unpleasant taste except the harsh acidity. At five years it was a fair wine.

These two experiments show that while high temperatures are injurious to both dry and sweet wines, they are absolutely fatal to the quality of the former, while the latter may recover to a certain extent, especially if they are fortified early. The fermentation of No. 1203 shows the inadequacy of full acidity to prevent the growth of bacteria in the must at high temperatures. Doubtless, however, if the acidity had been less, the injury would have been greater. It shows, also, how a wine may be completely invaded by bacteria when kept constantly warm, even though at no time during or after fermentation does the temperature go above 90° F. This is also an excellent illustration of a kind of fermentation which occurs frequently in cellars of the interior valleys. Musts with moderate and even low percentages of solid contents will stick with from 2% to 6% of unfermented sugar without ever attaining a dangerously high temperature. The cause is probably to be looked for in the kind of yeast which develops in the must, or in the deterrent effect on the yeast, of substances excreted by injurious ferments. The remedy in this case is the use of pure yeast or of yeast taken from a vat having a normal fermentation.

These experiments are supplemented by the large number of fermentations of Fresno and Tulare grapes made at this station. Though no special means were employed to keep down the temperature, the bulk of the fermentations may be considered cool, as compared with those taking place in the San Joaquin Valley. As little or no more bacterial troubles were experienced in the fermentation of Fresno and Tulare musts than with musts from cooler localities, the inference plainly is that the difference of must composition has less influence than the temperature conditions.

PLASTER AND AMMONIUM PHOSPHATE.

The difficulty of fermenting certain musts, especially those of the Zinfandel, from the interior valleys, suggested the series of experimental fermentations Nos. 1253, 1253*a*, and 1253*b*. The use of plaster, so general in Spain and the south of France, was compared with the use of ammonium phosphate, which has lately been recommended as a substitute, and with a normal fermentation. *Plaster* is supposed to act by increasing the acidity of the must and precipitating the albuminous matters, thereby favoring the growth of the vinous yeast, restricting the developing of secondary ferments, brightening the color, and causing a quicker clearing of the wine. *Ammonium phosphate* is supposed to act in a somewhat similar way and, besides, to increase the nitrogenous matters available for the nourishment of the yeast, thus causing quicker and more complete fermentation.

The grapes experimented with were Zinfandel from Fresno. They were received August 27, 1890, in good condition, and mature. The must showed 23.7% of solid contents by spindle and 0.54% of acid. The grapes were divided into three lots: No. 1253, No. 1253*a*, and No. 1253*b*. No. 1253 was fermented in the ordinary way; No. 1253*a* was fermented with the addition of 3 pro mille of calcium sulphate (plaster), and No. 1253*b* with 3 pro mille of ammonium phosphate. The temperature of the grapes at crushing was 72°. The maximum reached by No. 1253 was 77.5°, on the fourth day; the fermentation was slow, and on the seventh day the murk was drawn off while still sweet. The maximum reached by No. 1253*a* was 78°, on the fourth day; the fermentation was slow, but on the seventh day, when the murk was drawn off, it was less sweet than No. 1253. The maximum reached by No. 1253*b* was 86.5°, on the fourth day; the fermentation was quicker and more violent than either of the others, and on the fifth day, when the murk was drawn off, it was nearly dry.

No. 1253 (ordinary). One week after pressing the wine was quite dry, and in two weeks clear. In one month it was bright, and was racked. In two months it was bright, the lightest of the three in color, and rougher and less developed than No. 1253*a* and No. 1253*b*. The lees showed no bad germs except a few acetic; but two months later they showed some long filaments, and the wine was pasteurized. At eight months the wine was bright, of good flavor, with more bouquet than the others, and smoother than No. 1253*a*. At fifteen months it was in good order and preserved its superiority over No. 1253*a* and No. 1253*b*. It was quite mature, and two months later was bottled.

No. 1253*a* (plaster). One week after pressing the wine was quite dry, and in two weeks it was clear, and was racked. In two months it was bright, with more color than the control, but less than No. 1253*b*, without bouquet, and not equal to No. 1253*b* in flavor, but more developed than the control. The lees showed filaments at the same time as the control, and the wine was pasteurized at four months. It soon became bright, but at eight months it had less character than the control and had ceased to develop so quickly. At fifteen months it was bright and sound, with a little bouquet, good acid and astringency; a fair wine, but not equal in character to the control. It matured about the same time, and was bottled at seventeen months.

No. 1253*b* (ammonium phosphate). The wine was dry a few days

after pressing, and in two weeks was clear, and was racked. In two months it was the best of the series; bright, of fair color, the only one with any bouquet, and of agreeable and vinous flavor. The lees were examined at the same time as the others, and some *S. pastorianus* found, but no unsound germs, except a few acetic. The wine was pasteurized at the same time as the others, in order that the conditions should be the same for all. After pasteurizing it did not improve as much as the others, but became a little flat. It was bottled at the same time.

ANALYSES OF THE WINES.

ZINFANDEL.	No. 1253. (Ordinary.)	No. 1253*a*. (Plaster.)	No. 1253*b*. (Am. Phos.)
Alcohol by volume	11.64%	11.45%	11.55%
Tannin	.199	.191	.199
Total acid as tartaric (at pressing)	.58	.59	.46
Total acid as tartaric (at six to eight months)	.45	.52	.48
Body	2.78	3.22	3.08
Ash	.31	.55	.48
Sugar	.22	.24	.22
Sulphuric acid	.032	.028	.213
Phosphoric acid	.060	.196	.966
Extract	2.52	2.61	2.74

The addition of both calcium sulphate (plaster or gypsum) and ammonium phosphate resulted in a quicker maturing of the wine. At two months there was a notable difference in maturity, cleanness of taste, and general quality in favor of the wine fermented with ammonium phosphate, and, in a less degree, of that fermented with plaster. Secondary ferments were found in the control and in the plastered wine, but not in the wine treated with ammonium phosphate. At fifteen months the position of the wines, with regard to quality, was exactly reversed—the control best and the plastered wine second—while the wine with ammonium phosphate, which when young was the best, had become flat, and was distinctly inferior to the others. With regard to color, the treated wines showed about twice as much as the untreated. All three were, however, of very poor color, both as regards intensity and tint; the difference was, on the whole, in favor of the plastered wine, which showed also somewhat higher acidity than the others.

With regard to the other constituents of the wine, the difference was inappreciable, except for an increase in the sulphuric acid, phosphoric acid, and consequently in the ash, of the treated wines. The amount of sulphuric acid in the plastered wine is double the maximum for natural wines, and corresponds to an amount of sulphate of potash sufficient to have a very appreciable effect on the human system, but is less than is found in some of the heavily plastered wines of Spain. It is probable that a smaller amount of plaster would have had an equal effect as far as improvement in the quality of the wine is concerned. The results obtained are in accordance with European experiences, and are not such as to encourage the use of either of the substances employed. Doubtless the same and better results can be obtained by the use of pure ferments, low temperature of fermentation, and, when necessary, the addition of tartaric acid.

The same conclusion is to be drawn from a series of experimental fermentations made with Carignane, from Mission San José. The following is a record of the experiment:

No. 1409, Carignane, from Mission San José. Received October 20, 1890, in fair condition, very soft and a few bunches moldy. The must showed 24.8% of solid contents by spindle and 0.95% of acid. The grapes were divided into five lots of 279 lbs. each, and treated as follows:

No. 1409 was fermented in the ordinary way, with foulage twice a day and floating top. The temperature at starting was 68°, and the maximum, reached the third day, was 100°.

No. 1409*a* was fermented in a closed vat with only three foulages during the time it remained in the vat. The initial temperature was 68°.

No. 1409*b* was fermented with the addition of 272 grams of calcium sulphate (plaster). The initial temperature was 68°, and the maximum, reached on the fourth day, was 98°.

No. 1409*c* was fermented with the addition of 272 grams of calcium phosphate. The initial temperature was 68°, and the maximum was 101.5°, reached on the fourth day.

No. 1409*d* was fermented with the addition of 272 grams of ammonium phosphate. The initial temperature was 68°, and the maximum reached was 101°, on the third day.

All were pressed on the sixth day, with the exception of No. 1409*a*, the closed fermentation. They were all a little sweet when drawn off; No. 1409*b* (plaster) was the sweetest and No. 1409*c* (phosphate) the driest, the others were about the same. No. 1409*a* (closed) was pressed on the thirteenth day. The upper part of the vat was full of gas, and the pomace smelled perfectly sound and good; when the murk was drawn off it was nearly dry.

No. 1409 (open vat). At one month the wine was clear, had an agreeable flavor and some aroma, clean taste, medium acid and astringency. It became bright, and was racked twice during the first two months, at the end of which time the lees showed lactic fermentation, and the wine was pasteurized. A month later it was bright, had good bouquet, no taste of lactic taint, and, next to No. 1409*b* (plaster), the best flavor of the series; it was, however, newer-tasting and less developed than No. 1409*b* (plaster). After this the wine deteriorated and did not keep well in glass.

No. 1409*a* (closed vat). One month after crushing the wine still contained a little sugar and was still cloudy. In three months it was bright, but still a little sweet. A month later the lees showed some lactic ferment, and the wine was pasteurized, though the taste was not affected. At five months the wine was bright, smooth, and clean-tasting; it had rather less flavor than No. 1409 (open vat), but the best bouquet of the series, and still had a trace of sweetness. At fifteen months it was in good condition, a little flat, but the best of the series. Some of the wine was bottled at seventeen months and some at twenty-five. At three years both wines were tasted, and the second bottling was found in good order, smooth, and of good flavor, but with little bouquet; it had improved in the bottle. The wine first bottled had not kept well.

No. 1409*b* (plaster). At one month the wine was clear, clean-tasting, with pleasant flavor, medium acid and astringency, and a little bouquet. At three months it was bright and still retained a little sweetness. The lees remained sound, and the wine was not pasteurized. At five months the wine had been racked three times, and was in good order; it had a slight bitter taste and the bouquet was not equal to that of the witness or the close-fermented wine (No. 1409 and No. 1409*a*), but the flavor

was full and pleasing. After this the wine deteriorated, though the lees showed no bad ferments. It was bottled, part at seventeen and the rest at twenty-three months, but did not keep well in bottle.

No. 1409*c* (calcium phosphate). At one month the wine was clear, well flavored, and clean-tasting, but not quite equal to the open-vat sample. At three months it was bright, but not quite clean-tasting. A month later the lees showed lactic ferments, which had become perceptible to the taste, and the wine was pasteurized. At five months it was bright, but inferior to the first three of the series in flavor and bouquet, but superior to No. 1409*d* (ammonium phosphate). After this it deteriorated, but remained better than the latter.

No. 1409*d* (ammonium phosphate). The wine was bright one month after pressing, but was inferior to all the others of the series in flavor and aroma. At three months it had developed a little bouquet, but it was flat and its flavor was not very good. At four months the lees showed acetic and lactic ferments, and the wine was pasteurized. At five months it was clear, but not bright; no taste of lactic taint, but flat and the poorest in quality of the series. The wine did not improve and did not keep well in bottle.

ANALYSES OF THE WINES.

CARIGNANE.	No. 1409. (Open Vat.)	No. 1409*a*. (Closed Vat.)	No. 1409*b*. (Plaster.)	No. 1409*c*. (Calcium Phosphate.)	No. 1409*d*. (Ammonium Phosphate.)
Alcohol by volume	12.64%	13.09%	12.91%	12.18%	12.36%
Tannin	.213	.199	.213	.180	.217
Acid at pressing	.65				
Acid at six months	.66	.54	.62	.56	.48
Body	3.08	2.82	3.94	3.22	3.82
Sugar	.32	.26	.28	.26	.22

It will be noted that the wine made in the closed vat had the largest amount of alcohol, there being no opportunity for loss by evaporation; in the plastered wine the slowing down of fermentation seems to have produced the same effect.

EXPERIMENTS WITH BARTH'S APPARATUS.

Two experimental fermentations were made with an apparatus invented and patented by Mr. Barth, of San Francisco. It consisted essentially of a frame to retain the pomace at the bottom of the fermenting-tank. It is so constructed that it can be used either in an open vat or in a large closed vat or cask entered by a manhole. Small experiments were tried at the Station, with entirely negative results. For details of the experiments, see Mataro, Nos. 1596, 1596*a*, 1611, and 1611*a*, page 114. The machine is intended for use in closed fermentations, the pomace being retained at the bottom to prevent the superheating of the cap. The experiments, therefore, were hardly a fair test of the machine, as, on account of the small quantity of grapes fermented, there was little opportunity for overheating. It is a very efficient and easily manipulated machine to accomplish the object in view, viz., to keep the pomace at the bottom of the vat.

EXPERIMENTS WITH COLOR GRAPES.*

Though California wines have, as a rule, an abundance of color, there are varieties which, in some localities, are lacking in this respect. In order to remedy this defect, varieties of grapes exceptionally rich in color are sometimes planted. As the bulk of the wine comes from the grapes of less color, it is important that the grapes of more color should be used economically; that is to say, in such a way as to obtain the maximum coloring effect from them. Several experiments have been made to discover the best way of doing this.

Three samples of wine were made from Cinsaut, and Petite Sirah, from Tulare—

No. 2138. Cinsaut alone.

No. 2139. Petite Sirah alone.

No. 2139*a*. Blend of Cinsaut 53% and Petite Sirah 47%.

The following table shows the color record:

Sample.	At Pressing.	At One Month.	At Two Months.	At Three Months.
No. 2138. Cinsaut	3R+Y 10.0		3R+Y 4.4	3R+Y 4.2
No. 2139. Petite Sirah	2VR 30.0			1R 7.1
No. 2139*a*. Blend	5VR 15.4		R 8.9	R 5.7

Thus, in three months the Cinsaut lost 59% of its color, the Petite Sirah 76.3%, and the blend 63%. It is to be noted that the tint of the blend was much better than that of the Cinsaut. The color is small in

**Notation of Color Measurements.*—A detailed description of the method used at this laboratory to measure the color of red wine, and a full explanation of the scale, may be found on page 25 of the Viticultural Report, published in 1892. The letters used show the tint or shade of the wine, and run from violet-red to 3d red, according to the following scale:

Violet-Red.

1st violet-red.
2d violet-red.
3d violet-red.
4th violet-red.
5th violet-red.

Red.

1st red.
2d red.
3d red.

The brightest and most desirable tints are those near the top of the scale. They are the tints of the best color grapes and of new wines. As the wines become older the color changes under the influence of oxygen, and gradually drops down the scale, becoming finally yellowish or tawny. If the change continues after reaching the 3d red, the color is specified by adding letter Y to the other letters. This means that the color of the wine has become yellower than any of the tints of the scale, and that to obtain a perfect correspondence between the color of the wine and that of the scale it is necessary to look at the latter through a certain standard disk of yellow glass. Thus, when the color passes the 3d red it corresponds to the violet-red as seen through the yellow disk, and is indicated thus: VR+Y. This color then corresponds to what might have been called 4th red. The use of the yellow disk enables us to double the range of the scale, or to triple it by the use of two disks, though this is rarely necessary. Any wine whose color passes below the 3d red into the orange-reds may be considered defective, except in the case of sweet and fortified wines, which always show a yellowish tint.

The numbers after the letters indicate the intensity or amount of color possessed by a wine. No standard has been fixed as to the amount of color which a wine should possess. Any dry red wine, however, which drops below 10 may be considered deficient in amount of color, while any which retains over 25 at six months will bear dilution with lighter-colored wines.

amount, but the superiority of tint makes it a great improvement. There is an evident loss of color in fermenting the two grapes together, due to the taking up of color by the pomace of the Cinsaut. If the blend had been made directly after pressing, the color would have been 19.7 instead of 15.4. If, however, the wines had been kept for three months and then blended, the color would have been 5.5 instead of 5.7—a slightly greater loss than by fermenting the grapes together. These calculations are made on the supposition that there would be no actual loss of color in blending the two wines, which, judging from other experiments made, is not strictly true. To preserve the maximum amount of color, then, in this instance, it would have been best to have fermented each grape separately and blended the wines immediately after pressing.

An experiment made with Petit Bouschet and Clairette blanche gave results in some respects confirmatory of the above, in others apparently contradictory. The following were the samples made:

No. 2225. One third Petit Bouschet and two thirds Clairette blanche.

No. 2226. Petit Bouschet alone.

The blend was made before fermentation, and the color record is as follows:

Sample.	At Pressing.		At One Month.		At Two Months.		At Three Months.	
No. 2225. Blend	4VR	28.8	5VR	14.5	5VR	16.5	1R	7.3
No. 2226. Petit Bouschet	2VR	105.0	1VR	75.5	1VR	64.5	1VR	42.5

In this case the Petit Bouschet lost less (59.5%) of its color than did the blend (74.7%). This is doubtless due to the effect of the chemical composition of the Clairette blanche, rendering its wine less retentive of color than that of the Petit Bouschet. As in the former experiment, there is a loss of color in the blend, due probably to the taking up of color by the white pomace.

Apparently there should have been 35 of color in the blend; that is, one third of the amount in the Petit Bouschet alone, instead of 28.8. There is also a degradation of tint, slight at first, but very marked at three months.

There would doubtless have been some of this loss of intensity and degradation of tint even if the wines had been blended after pressing, for it seems to occur whenever wines of different intensities of color are blended, especially when one is a white wine. This is exemplified by the following series of experiments with wine made from Rupestris grapes.

No. 1907, Rupestris, from R. Hill, Glen Ellen, Sonoma County. The grapes were received in good condition on October 5, 1893. The bunches were cylindrical, well filled, and from two to three inches long; the berries spherical, from three to five lines (line=$\frac{1}{12}$ inch) in diameter, very ripe, and commencing to shrivel. The must showed 27.2% of solid contents by spindle and 0.64% of acid. Twenty-four pounds were crushed and fermented. The temperature of the must at starting was 67° F., and the maximum, reached on the third day, was 80° F. On the fourth day the wine was dry, and was drawn off. The color of the wine was extraordinary, far exceeding anything ever shown by European grapes. The color of the must before fermentation was 3R—83.3, which is higher than the average for red wines after fermentation. After fermentation

the wine showed VR—444.4, a color so intense as to appear quite black before dilution. This amount of color is sufficient to allow of the addition of from 2,000% to 3,000% of white wine and still have a wine of good and sufficient color, providing there were no loss in blending. That there is a very considerable loss, however, is shown by the following experimental blends:

A. Rupestris undiluted.

B. Rupestris blended with Cinsaut of 1892 from Tulare. The color of the Cinsaut was so low as to be unreadable on the scale. It had 10.9% of alcohol by volume and 0.47% of acid.

C. Rupestris blended with Burger of 1892 from Tulare. The Burger had 9.73% of alcohol by volume and 0.51% of acid.

D. Rupestris blended with Carignane of 1893 from Tulare. The color of the Carignane was VR+1Y—4.2, its alcohol 9.9% by volume, and acid 0.53%.

E. Rupestris blended with Kleinberger of 1893 from Paso Robles. The Kleinberger had 9.0% of alcohol by volume and 0.6% of acid.

All these blends were made with 8% of Rupestris and 92% of the other variety.

TABLE OF COLOR READINGS.

Sample.	At Blending.		Loss.	At Two Weeks.		Loss.	At Two Months.		Loss.
A	VR	444.0		VR	210	52.7%	4VR	143	67.8%
B	5VR	17.5	50.7%	3VR+1Y	13.8	21.2			
C	2VR	22.9	35.5	4VR	14.3	37.5	1R	9.9	56.7
D	3VR	28.0	28.9	4VR	20.7	26.1	R	12.5	55.4
E	VR	30.3	14.7	4VR	18.7	38.3	3R	14.2	53.9

In the first column headed "loss" is given the proportion of color lost in blending: that is, how much color the blends lacked of 35.5 for B, C, and E, and of 39.4 for D, which they would have had if there had been no loss. The other two columns headed "loss" show the proportions lost after blending.

The loss after blending is fairly equal for all the blends, and is uniformly less than that of the unmixed Rupestris. The losses at blending, however, show great variation and indicate the great effect which the character of the white or light-colored wine used has on the color of the blend. The loss is greater when the blend is made with a one-year-old wine than when made with a new wine, as may be seen by comparing B and C with D and E. The last sample, E, shows a much smaller loss for the Paso Robles wine than for the three Tulare wines. There is the greatest loss with a one-year-old wine from Tulare, and the least with a new wine from Paso Robles. The effect of variety may be seen by comparing B with C. Here the Cinsaut, which is notoriously poor at keeping its color, has lost much more than the Burger of the same age and locality. It is to be noted, also, that the loss in blending is, roughly speaking, proportionate to the alcoholic strength and inversely proportionate to the acidity of the wine used.

We see, then, by these experiments, that the most effective way of utilizing the color of coloring grapes is to ferment them separately, and to make the blend immediately after pressing. If the grapes are fermented together, the pomace takes up too much of the color. If the blending is deferred any length of time after pressing there is a loss in

another way, for, other things being equal, the deeper the color of a wine the more it loses in a given time. We also see that we cannot tell *a priori* how much of a certain wine must be added to another to produce a desired tint or depth of color. This can only be done experimentally, for the amount of color lost in blending varies according to the age and character of the wines blended.

ASAPROL.

Asaprol has been recommended as a means of preventing the attainment of too high temperatures during fermentation. It is a light, brown-pink powder, said to be innocuous, and, as its name indicates, tasteless. No data have been found as to its chemical composition, but probably, like many commercial products, it has no definite composition formula. All that seems to be known about it is that it is one of the coal-tar products, and is supposed to act in minute doses as a mild antiseptic, reducing the vigor of the yeast without permanently injuring it or preventing it from thoroughly eliminating the sugar. Thus, it is said, it causes the fermentation to be longer and less violent, but finally more complete. Its use is based on the same principle as that of sulphurous acid, and is intended to temporarily restrain the rapid multiplication of the yeast in the same way as do the sulphur fumes when sulphur is burned in a cask before putting in the must.

A series of experiments was undertaken with the object of ascertaining the truth of these claims. The first experiments were made with concentrated must containing the skins. As the must was four years old it probably contained little living yeast. It was diluted to 20.2% of solid contents, and strained from the skins. Three fermentations were made, as follows:

A. 1,500 c.c. Must with $\frac{1}{2}$ gr. of asaprol.
B. 1,500 c.c. Must with $\frac{1}{4}$ gr. of asaprol.
C. 1,500 c.c. Must without addition.

The temperature of the must was 62° F., and there was no sign of fermentation in any of the vessels at the end of forty-eight hours. All were then warmed to 85° F. The next day the wine to which no addition had been made was giving off bubbles. The lees of all showed an abundance of micro-organisms, like yeast in appearance, but which were probably *Mycoderma vini*, for the next day they were all covered with a scum of wine-flowers, the treated wines thickly, the untreated less plentifully. The wine-flowers increased rapidly on the treated wines, and it was not until the sixth day that they gave off any gas. The scum soon disappeared from the wine without asaprol, and the fermentation became rapid, ceasing when the wine was dry, on the fourteenth day. The fermentation was very slow in the wines containing asaprol, and on the fourteenth day they were still sweet and covered with a remarkably thick scum of wine-flowers. These experiments showed that a dose of 0.017% of asaprol had a marked deterrent effect on alcoholic fermentation, but was apparently favorable to the development of wine-flowers. A parallel set of experiments was made, differing from the above only in having the must with 25.5% of solid contents. There was an abundant development of wine-flowers in all, but no fermenta-

tion, showing that there was no yeast present, or that the yeast was too much debilitated to ferment in so strong a must.

For another experiment the must was diluted to 24.0% of solid contents and 0.60% of acid. To 1,500 c.c. of must 1 gram of asaprol was added. This, together with a control fermentation of the same size without addition, was kept in a warm chamber, at 80° to 82° F. Both fermented and showed an abundance of wine-flowers, but neither went through. At this temperature the asaprol had apparently no effect. The same must, with 1% of asaprol, did not ferment at all.

In order to obtain results under more nearly normal conditions, another series of experiments was made later with fresh grape-juice. The must had 23.0% of solid contents by spindle, and was divided into the following lots: A, to which was added 0.5% of asaprol; B, 0.1%; C, 0.05%; D, 0.01%, and E, to which no addition was made.

The fermentations were carried on in bottles containing each 100 gr. of must, kept in a room at 66° to 68° F. The bottles of must were sterilized, and when cool 3 c.c. of fermenting must and the indicated amount of asaprol were added to each. The must containing 0.5% of asaprol fermented very slowly, and at fifteen days contained 2.8% of alcohol and 15.6% of solid contents by spindle. It tasted perfectly dry, showing that, though there had been little fermentation, the sugar had undergone some chemical change.

At fifteen days the three wines containing the smallest amounts of asaprol were cloudy, while that containing the largest amount and the witness containing none were nearly clear. The musts containing 0.1% and 0.05% fermented more slowly and regularly than the witness. The witness and the must containing 0.01% fermented more violently during the first few days, but at fifteen days had not eliminated any more sugar than the others, with the exception of the one containing 0.5% of asaprol. When all visible signs of fermentation were over, the wine containing the heaviest dose of asaprol tasted quite dry, and all the others slightly and about equally sweet. The following table of analyses, made by Mr. G. E. Colby, shows the alcoholic and solid contents of each sample at fifteen days and at the end of all sensible fermentation:

Description of Experiments.	Alcohol at Fifteen Days.	Solid Contents by Spindle at Fifteen Days.	Solid Contents by Spindle at End of Fermentation.
A, containing 0.50% of asaprol	2.8%	15.6%	11.4%
B, containing 0.10% of asaprol	9.4	7.3	4.3
C, containing 0.05% of asaprol	9.9	7.1	3.7
D, containing 0.01% of asaprol	9.9	6.8	4.4
E, containing no addition	9.1	7.3	4.0

These experiments show that asaprol used in the ratio of about 5 to 10,000 of must has a slackening and regulating effect on the fermentation without preventing the final and complete conversion of the sugar into alcohol. The latter is a fair conclusion, for, though none of the wines became perfectly dry, the amount of sugar in the witness was equal to that in the wine containing the above quantity of asaprol. In the ratio of 1 to 10,000 it has little or no effect, unless the yeast is in an inactive condition. In doses of 5 to 1,000 it seriously impedes alco-

holic fermentation, and spoils the wine by destroying or changing the sugar without the production of alcohol.

If used in the ordinary fermenting-vats, therefore, asaprol would doubtless have the effect claimed for it, viz., by weakening and retarding the fermentation to prevent the undue heating of the wine. It has the advantage over sulphurous fumes of giving no taste to the wine. It is, however, subject to the same objections as other antiseptics. It is probably, like them, injurious to the stomach, even in small doses, and should certainly not be used until more is known of its nature in this regard.

Our experiments tend to show, also, that its action is greater upon alcoholic yeasts than upon other organisms and ferments in the must. Thus, while preventing undue heating, by hampering the development of the yeast, it allows other organisms to take possession of the wine, causing, in another way, the very trouble it is intended to prevent. It is very doubtful, then, if asaprol can be used with any more advantage than sulphur, and as the ends intended to be attained by the use of these antiseptics can be easily compassed by purely mechanical means, there remains no excuse or need for their use.

ON THE QUANTITIES OF NITROGENOUS MATTERS CONTAINED IN CALIFORNIA MUSTS AND WINES.

By George E. Colby.

Introductory Note, by E. W. Hilgard.—The nitrogenous substances contained in grapes and wine have heretofore formed the subject of a number of investigations, but the conclusions reached as to the nature of these substances, and of the part they play in respect to the various qualities and diseases of wine, have not been as definite as could be desired, largely because of the failure to continue them systematically through a number of years with wines derived from different localities. The importance of the problems involved, specially as regards the connection with the fermenting and keeping qualities, and the variety of climates and soils existing in California, seemed to render this State particularly adapted to experimental investigation of this subject; which has now continued for a sufficient length of time, and has accumulated enough data, to determine definitely some points at least in the complex question. A preliminary account of the first part of this work was prepared by Mr. L. Paparelli, formerly assistant in charge of viticulture at the University, and Mr. George E. Colby, the chemical assistant in charge of viticultural work; it was read at the Indianapolis meeting of the Society for the Promotion of Agricultural Science, in August, 1890. The conclusions then reached were largely tentative, because of the relatively small number of determinations then available; they have since been greatly extended by Mr. Colby's work, and, on the whole, the conclusions first reached have been closely verified.

Broadly stated, these may be said to be that the *absolute amounts* of nitrogen in wines stand in no direct relation either to intrinsic excellence (as has been repeatedly affirmed) or to the keeping qualities of wines; and that the significance of the nitrogenous ingredients of wines must be sought in their *kind* and not in their total amounts. It is intended to prosecute this part of the research as time and means will permit, in connection with the data already obtained.

While there can be no question of the propriety of removing as far as possible a certain portion of the nitrogenous matters prior to fermentation (usually by aëration of the must), and while there can be little question that the portion thus precipitated contains true albuminoids, it is extremely probable that a large but variable part of the remaining nitrogen is contained in the form of compounds of the "amido" class, which are not affected by the reagents used to precipitate albuminoids, but are well known to serve in building up the latter for use in plant tissues, while also forming an intermediate stage in their final breaking-down, of which urea is the last link. It will be of no little interest, theoretical as well as (probably) practical, to determine the nature of these intermediate substances and their relation to the nutrition of yeast

and the various qualities of wines. But such investigations are extremely difficult and complex, requiring both ample time and copious resources to be carried to a successful issue. (E. W. H.)

The nitrogenous substances in wine, and the part they play in fermentation and diseases of wine, have heretofore been studied by many chemists. In a country like California, where viticulture takes so important a place, the study of the qualities of albuminoid matters in the musts and wines of the State becomes necessary with a view to the possible explanation of their influence on quality and of the causes of their numerous diseases; above all, of lactic fermentation, which is the most common trouble of California wines. This is the more important as most of the wines attacked by lactic fermentation are rebellious to all treatments for conservation; pasteurizing having but little beneficial effect, save as a preventive measure.

We have, therefore, begun and carried on the study of the question and its relation to the condition of the soil, season, growth of vines, temperature of fermentation, etc.—data which influence materially the chemical composition of musts and wines.

Selection has been made of the characteristic members of each type of grape grown at the various culture sub-stations of the department, and an effort has been made to represent for the red-wine varieties all the grape-growing regions of California. Doubtless, had the work been advanced further for the white-wine varieties of grapes the results would have been very similar to those here given for the red-wine varieties.

The musts examined were filtered and analyzed by the Kjeldahl method for the determination of nitrogen; the nitrogen contained in the musts and wine may be calculated as "albuminoids" by use of the usual coefficient of 6.25. Many of the musts examined had no corresponding wine, because of lack of enough grapes for the fermentation experiment.

All but about one dozen of the wines reported in the tables below were made here at the station; a description of the methods of fermentation, age, etc., will be found in the part of this report relating to wines.

Four points of view presented themselves primarily, viz.:

1. The difference in nitrogen between types and varieties;
2. The influence of different climatic and soil conditions upon the nitrogen of the musts;
3. The changes brought about by the vinification of the musts by one and the same method of treatment;
4. The differences that may result from the different methods of vinification in one and the same as well as in different musts.

It need hardly be said that to carry out such investigations for a large number of these variable and inter-connected data with all their various combinations, would form the work of several lifetimes; but it is to be hoped that in the course of research some guiding principles will be evolved that will materially abridge the labors of the analysts and convey important practical information to the wine-maker.

Table A illustrates the first three points of view. Tables B and C aid, each in its particular place, to emphasize and clearly separate the facts compiled in Table A. Table D shows the fourth point.

TABLE A.

DETERMINATION OF NITROGEN (*Resp.* "ALBUMINOIDS") IN SAMPLES OF FILTERED MUSTS (VINTAGES OF 1889, 1890, 1891, 1892, AND 1893), AND IN SAMPLES OF WINE MADE FROM THE SAME MUSTS.

(NOTE.—R placed after the number indicates wines sent for examination.)

Number.	Variety and Place of Production.	Vintage.	MUST.		WINE.					
			Nitrogen Per Cent.	Albuminoids Per Cent.	Nitrogen Per Cent.	Albuminoids Per Cent.	Differences. Albuminoids in Must and Wine. Absolute	Differences. Albuminoids in Must and Wine. Per Cent.	Body	Per Cent. of Nitrogen in 100 Body.
	BORDEAUX TYPE.									
	Cabernet Sauvignon.									
1820	Amador station	1893	.025	.156						
1347	Cupertino	1890	.082	.513						
1632R	Gubserville	1885			.041	.256			3.10	1.32
1633R	Gubserville	18-7			.057	.356			2 55	2.24
1640R	Gubserville	1889			.057	.356			2.60	2.19
1634R	Gubserville	1890			.037	.243			2.05	1.84
1635R	Gubserville	1890			.035	.219			3.23	1.08
1636R	Gubserville	1891			.049	.306			2.80	1.75
1113	Mission San José	1889	.097	.606	.089	.556	.046	8.2	2.78	3.20
1342	Mission San José	1890	.060	.375	.042	.262	.113	30.1	2.78	1.54
1765	Mission San José	1892	.075	.468	.038	.237	.191	49.3	2.85	1.34
1248	Fresno	1890	.036	.225						
2207	Tulare	1894	.071	.444						
1554	Paso Robles	1891	.076	.475						
1914	Paso Robles	1893	.062	.387	.055	.343	.040	11.3	3.10	1.80
	Cabernet Franc.									
1336	Cupertino	1890	.042	.263						
1522	Mission San José	1891	.088	.550						
1559	Paso Robles	1891	.080	.500						
	Gros Verdot.									
1331	Cupertino	1890	.041	.256						
1631R	Gubserville	1891			.042	.263			3.02	1.05
1382	Mission San José	1890	.098	.613	.052	.325	.288	46.9	3.32	1.53
1250	Fresno	1890	.059	.368						
1681	Tulare	1892	.138	.862						
1551	Paso Robles	1891	.091	.569						
	Malbeck.									
2195	Amador station	1893	.037	.231						
1321	Cupertino	1890	.053	.330						
1303	Mission San José	1890	.092	.577						
1475	Fresno	1891	.063	.393						
1797	Tulare	1893	.070	.437	.053	.331	.106	24.0	3.80	1.39
1489	Paso Robles	1891	.081	.506						
1917	Paso Robles	1893	.077	.481	.047	.294	.187	38.9	3.30	1.42
	Tannat.									
1835	Amador station	1893	.014	.087						
1389	Cupertino	1890	.037	.231						
1302	Mission San José	1890	.125	.782	.068	.425	.357	45.7	3.50	1.94
2322	Tulare	1894	.041	.256						
1560	Paso Robles	1891	.079	.493						
1911	Paso Robles	1893	.060	.375	.026	.162	.213	56.7	3.30	.78
	Teinturier mâle.									
2196	Amador station	1894	.064	.400						
1283	Cupertino	1890	.066	.413	.035	.219	.194	47.0	3.28	1.06
1292	Mission San José	1890	.102	.638	.058	.362	.276	43.2	2.78	2.08
1205	Fresno	1890	.063	.394	.029	.181	.213	54.1	3.20	.90
1943	Tulare	1893	.141	.881						
1497	Paso Robles	1891	.092	.575	.074	.463	.112	19.5	3.05	2.42

TABLE A—Continued.

Number	Variety and Place of Production.	Vintage	MUST.		WINE.					
			Nitrogen Per Cent.	Albuminoids Per Cent.	Nitrogen Per Cent.	Albuminoids Per Cent.	Differences, Albuminoids in Must and Wine.		Body	Per Cent of Nitrogen in 100 Body.
							Absolute.	Per Cent.		
	Gamai Teinturier.									
1823	Amador station	1893	.016	.100						
1073	Cupertino	1889			.019	.121			3.07	.62
1276	Cupertino	1890	.047	.294	.023	.142	.152	51.9	2.58	.85
1058	Mission San José	1889			.049	.307			2.65	1.85
1294	Mission San José	1890	.080	.500	.044	.273	.227	45.4	3.08	1.10
1228	Fresno	1890	.039	.244						
2209	Tulare	1894	.089	.556						
1866	Paso Robles	1893	.082	.513	.043	.268	.245	47.7	2.95	1.45
	St. Macaire.									
2197	Amador station	1894	.041	.256						
1281	Cupertino	1890	.056	.350	.024	.150	.200	57.1	3.08	.79
1637R	Gubserville	1890			.034	.212			2.85	1.19
1638R	Gubserville	1891			.046	.287			3.00	1.53
1295	Mission San José	1890	.070	.438	.023	.142	.296	67.1	2.82	.82
1706	Mission San José	1892	.055	.344	.026	.163	.181	52.6	3.20	.80
1443	Tulare	1891	.079	.493						
1846	Tulare	1893	.076	.477	.041	.256	.221	46.3	3.30	1.24
	BURGUNDY TYPE.									
	Pinot de Pernand.									
1367	Cupertino	1890	.067	.419						
1504	Mission San José	1891	.097	.606						
1258	Mission San José	1890	.100	.625	.050	.313	.312	50.0	3.10	1.61
1799	Tulare	1893	.094	.577						
1226	Fresno	1890	.101	.631						
1480	Paso Robles	1891	.074	.472						
	Pinot St. George.									
1819	Amador station	1893	.040	.250	.019	.119	.132	52.8	3.30	.59
1332	Cupertino	1890	.110	.688						
1508	Mission San José	1891	.083	.519						
1910	Mission San José	1893	.070	.437	.033	.207	.230	52.6	2.40	1.37
1224	Fresno	1890	.083	.519						
2005	Tulare	1893	.057	.356						
1480	Paso Robles	1891	.067	.419						
	Meunier.									
1808	Amador station	1893	.042	.262						
1280	Cupertino	1890	.043	.269						
1259	Mission San José	1890	.087	.544						
1212	Fresno	1890	.060	.375						
2309	Tulare	1894	.063	.394						
1558	Paso Robles	1891	.047	.295						
	**Chauché noir.*									
1832	Amador station	1893	.030	.187						
1290	Cupertino	1890	.065	.406						
1298	Mission San José	1890	.117	.731	.056	.345	.381	52.0	2.45	2.22
1446	Tulare	1891	.165	1.031						
1620	Tulare	1892	.188	1.175	.105	.656	.519	44.1	3.00	3.50
1557	Paso Robles	1891	.070	.437						
1868	Paso Robles	1893	.079	.494	.038	.237	.257	52.0	3.10	1.22

*The Chauché noir is classed with the Burgundies because it is used largely in the make-up of wines sent out under that name.

TABLE A—Continued.

Number	Variety and Place of Production.	Vintage	MUST. Nitrogen Per Cent	MUST. Albuminoids Per Cent	WINE. Nitrogen Per Cent	WINE. Albuminoids Per Cent	WINE. Differences, Albuminoids in Must and Wine. Absolute	WINE. Differences, Albuminoids in Must and Wine. Per Cent	WINE. Body	WINE. Per Cent of Nitrogen in 100 Body
	Robin noir.									
2199	Amador station	1894	.033	.206						
1284	Cupertino	1890	.025	.156						
1428	Mission San José	1890	.056	.350						
1953	Mission San José	1893	.062	.385	.049	.306	.078	20.3	2.60	1.88
1230	Fresno	1890	.026	.162						
2396	Tulare	1894	.045	.281						
1552	Paso Robles	1891	.104	.650						
	SOUTHERN FRENCH TYPE.									
	Petite Sirah.									
1278	Cupertino	1890	.065	.406						
1296	Mission San José	1890			.052	.325			3.45	1.50
1492	Paso Robles	1891	.085	.531						
	Serine.									
2086	Amador station	1894	.051	.319						
1147	Cupertino	1889			.035	.229			3.50	1.00
1370	Cupertino	1890	.061	.381						
1341	Mission San José	1890	.088	.551	.047	.294	.257	46.9	3.32	1.40
1042	Fresno	1889			.044	.275			3.80	1.15
1242	Fresno	1890	.055	.344	.027	.168	.176	51.1	2.70	1.00
1488	Tulare	1891	.103	.643						
1814	Tulare	1893	.109	.681	.067	.419	.262	38.4	3.20	2.10
1488	Paso Robles	1891	.072	.450						
1895	Paso Robles	1893	.089	.546	.054	.337	.209	39.3	3.30	1.66
	Mondeuse.									
2174	Amador station	1894	.022	.137						
1595	Los Guilicos	1891	.041	.256	.027	.168	.088	34.1	3.35	.81
1312	Cupertino	1890	.052	.325	.016	.100	.225	69.1	2.70	.59
1151	Cupertino	1889	.080	.500	.056	.351	.149	30.0	3.05	1.85
1142	Mission San José	1889	.088	.550	.073	.456	.094	17.0	2.87	2.50
1334	Mission San José	1890	.071	.444	.028	.175	.269	60.5	2.58	1.08
1639R	Gubserville	1891			.032	.200			2.55	1.25
1888	Tulare	1893	.056	.350	.024	.150	.200	57.1	2.30	1.04
1922	Paso Robles	1893	.068	.425	.036	.225	.200	47.1	3.30	1.09
	Cinsaut.									
1825	Amador station	1893	.044	.275						
2050	Cupertino	1893	.056	.350						
1403	Mission San José	1890	.095	.596	.053	.331	.265	44.4	2.58	2.05
1477	Paso Robles	1891	.077	.481						
1434	Tulare	1891	.171	1.069	.124	.775	.294	27.4	3.80	3.26
1614	Tulare	1892	.140	.870	.093	.581	.289	33.2	2.95	3.10
	Mataro.									
1069	Amador station	1889	.045	.281	.021	.131	.151	53.3	2.70	.80
1255	Amador station	1890	.036	.225	.015	.094	.131	58.1	2.58	.58
1596	Asti, Sonoma County	1891	.037	.231	.022	.137	.094	40.8	3.35	.66
1609	Mountain View	1891	.049	.306	.019	.119	.187	61.1	2.55	.74
1610	San José	1891	.029	.179	.010	.063	.116	65.3	2.45	.41
1252	Fresno	1890	.035	.218	.011	.069	.149	69.8	2.32	.47
1921	Paso Robles	1893	.076	.475	.023	.144	.331	69.6	2.30	1.00
2313	Tulare	1894	.042	.262						

TABLE A—Continued.

Number	Variety and Place of Production.	Vintage	MUST.		WINE.				Body	Per Cent of Nitrogen in 100 Body
			Nitrogen Per Cent	Albuminoids Per Cent	Nitrogen Per Cent	Albuminoids Per Cent	Differences, Albuminoids in Must and Wine. Absolute	Differences, Albuminoids in Must and Wine. Per Cent		
	Carignane.									
1070	Amador station	1889	.032	.200	.011	.069	.131	65.6	3.07	.36
1525	Asti, Sonoma County	1891	.026	.162	.010	.063	.099	61.9	2.78	.39
1335	Cupertino	1890	.050	.313						
1409	Mission San José	1890	.100	.625	.048	.300	.325	52.0	3.08	1.55
1251	Fresno	1890	.026	.163	.007	.044	.119	72.4	2.36	.28
1447	Tulare	1891	.058	.362						
1628	Tulare	1892	.065	.406	.031	.194	.212	52.2	3.30	.94
1887	Tulare	1893	.075	.469	.035	.219	.260	53.4	2.60	1.34
1576	Paso Robles	1891	.049	.306	.033	.206	.100	32.6	2.60	1.27
	Grenache.									
1822	Amador station	1893	.034	.212						
1333	Cupertino	1890	.053	.331						
1249	Fresno	1890	.020	.125	.015	.094	.031	24.8	3.02	.50
1444	Tulare	1891	.068	.425						
1626	Tulare	1892	.060	.375	.041	.256	.119	31.7	2.90	1.40
1527	Paso Robles	1891	.070	.440						
1721	Paso Robles	1892	.050	.313	.028	.175	.138	44.0	2.85	.99
	César.									
1594	Los Guilicos	1891	.072	.045	.045	.281	.169	37.5	3.35	1.34
	Petit Bouschet.									
1394	Cupertino	1890	.094	.588						
1378	Mission San José	1890	.100	.625	.052	.325	.300	48.0	3.32	1.56
1245	Fresno	1890	.097	.606						
1435	Tulare	1891	.060	.375	.045	.281	.094	25.1	3.12	1.40
1529	Paso Robles	1891	.091	.568						
2009	Paso Robles	1893	.079	.493	.051	.319	.174	35.3	3.10	1.64
	Aramon.									
2316	Amador station	1894	.040	.250						
1189	Cupertino	1889			.015	.095			3.50	.43
1414	Cupertino	1890	.060	.375	.033	.206	.169	45.1	2.82	1.18
1175	Mission San José	1889			.042	.273			2.67	1.60
1377	Mission San José	1890	.081	.506	.046	.287	.219	43.3	2.58	1.70
1246	Fresno	1890	.035	.219	.011	.069	.150	68.3	2.82	.38
1436	Tulare	1891	.055	.344						
1639	Tulare	1892	.061	.381	.032	.200	.181	47.3	2.65	1.20
1755	Paso Robles	1892	.055	.344						
	AUSTRIAN AND HUNGARIAN TYPE.									
	Zinfandel.									
1071	Amador station	1889	.043	.269	.028	.175	.094	34.9	3.07	.90
1257	Amador station	1890	.021	.131	.013	.081	.050	38.1	2.82	.45
1098	Fresno	1889	.061	.381	.047	.294	.087	22.9	3.50	1.34
1253	Fresno	1890	.030	.187	.015	.094	.093	49.9	2.78	.54
	Blue Portuguese.									
1365	Cupertino	1890	.061	.381						
1262	Mission San José	1890	.087	.544	.042	.262	.282	51.7	2.58	1.60
1206	Fresno	1890	.057	.356	.025	.156	.200	56.1	3.08	.80
1440	Tulare	1891	.104	.650						
1618	Tulare	1892	.090	.560	.067	.419	.141	25.4	3.08	2.20
1481	Paso Robles	1891	.077	.481						
	Rothgipfler (White).									
1800	Amador station	1893	.065	.406						
1359	Mission San José	1890	.063	.396						
1530	Paso Robles	1891	.077	.481						

TABLE A—Continued.

Number	Variety and Place of Production.	Vintage	MUST.		WINE.					
			Nitrogen Per Cent.	Albuminoids Per Cent.	Nitrogen Per Cent.	Albuminoids Per Cent.	Differences, Albuminoids in Musts and Wine.		Body	Per Cent of Nitrogen in 100 Body.
							Absolute.	Per Cent.		
	Marzemino.									
1293	Cupertino	1890	.065	.406						
1358	Mission San José	1890	.042	.252						
1231	Fresno	1890	.014	.087						
	Grüner Velteliner (White).									
1306	Cupertino	1890	.047	.293						
1346	Mission San José	1890	.075	.468	.025	.156	.312	66.6	2.58	.94
1208	Fresno	1890	.041	.256	.017	.106	.150	58.6	1.80	.94
	Kadarkas.									
1307	Cupertino	1890	.071	.443	.032	.200	.243	54.8	2.58	1.24
1418	Mission San José	1890	.107	.668	.076	.475	.188	28.9	3.58	2.13
1461	Fresno	1891	.064	.400						
	White Vernaccia.									
1400	Cupertino	1890	.045	.281						
1422	Mission San José	1890	.072	.450						
1236	Fresno	1890	.043	.268						
1549	Paso Robles	1891	.079	.493						
	NORTH ITALIAN TYPE.									
	Fresa.									
2175	Amador station	1894	.034	.212						
1327	Cupertino	1890	.065	.406						
1469	Fresno	1891	.059	.369						
2318	Tulare	1894	.049	.306						
1553	Paso Robles	1891	.086	.537						
	Barbera.									
2276	Asti, Sonoma County	1894	.057	.356						
1324	Cupertino	1890	.085	.531						
1573	Mission San José	1891	.065	.406	.034	.213	.193	47.7	3.25	1.04
1445	Tulare	1891	.094	.587						
1675	Tulare	1892	.075	.468	.032	.200	.268	57.3	3.20	1.00
	Nebbiolo, or Spanna.									
1857	Amador station	1893	.034	.212						
2277	Asti, Sonoma County	1894	.037	.231						
1401	Cupertino	1890	.056	.350						
1285	Cupertino	1890	.028	.175						
1554	Paso Robles	1891	.067	.419						
1954	Paso Robles	1893	.085	.531	.052	.325	.206	38.8	2.85	1.83
1958	Paso Robles	1893	.074	.462						
	Refosco.									
1416	Cupertino	1890	.084	.525						
1584	Mission San José	1891	.112	.700	.056	.350	.350	50.0	3.45	1.62
	Crabb's Black Burgundy.									
1526	Asti, Sonoma County	1891	.042	.262	.028	.175	.087	33.3	2.95	.94
1318	Cupertino	1890	.057	.356	.030	.187	.169	47.4	2.78	1.06
1343	Mission San José	1890	.091	.569	.041	.256	.313	55.0	3.32	1.20
1219	Fresno	1890	.081	.506						
1437	Tulare	1891	.081	.506						
1615	Tulare	1892	.088	.550	.040	.250	.300	54.5	3.05	1.38
1496	Paso Robles	1891	.068	.425	.047	.293	.132	30.8	2.80	1.60

TABLE A—Continued.

Number	Variety and Place of Production.	Vintage	MUST.		WINE.					
			Nitrogen Per Cent.	Albuminoids Per Cent.	Nitrogen Per Cent.	Albuminoids Per Cent.	Differences, Albuminoids in Must and Wine.		Body	Per Cent of Nitrogen in 100 Body.
							Absolute	Per Cent.		
	Dolcetto.									
1572	Asti, Sonoma County	1891	.049	.308	.027	.168	.140	45.4	2.60	1.30
	Barolo.									
1575	Asti, Sonoma County	1891	.064	.400	.033	.206	.194	48.5	3.20	1.03
	Bonarda.									
1384	Cupertino	1890	.055	.344	.023	.144	.200	58.1	2.58	.85
1362	Cupertino	1890	.055	.344	.035	.219	.125	36.3	2.70	1.29
1385	Cupertino	1890	.067	.418						
2310	Tulare	1894	.071	.444						
1869	Paso Robles	1893	.079	.493	.045	.281	.212	43.0	2.80	1.60
	Gros Mansenc.									
2198	Amador station	1893	.034	.212						
1277	Cupertino	1890	.056	.350	.028	.175	.175	50.0	2.82	.98
1339	Mission San José	1890	.087	.544	.038	.237	.307	56.4	2.82	1.36
1243	Fresno	1890	.050	.313	.016	.100	.213	68.0	2.95	.54
1899	Tulare	1893	.088	.548	.049	.306	.242	44.3	3.80	1.29
1547	Paso Robles	1891	.066	.412						
2083	Paso Robles	1893	.093	.582	.049	.306	.276	47.3	2.85	1.72

EXAMINATION OF THE MUSTS.

Differences between the Different Types.—In estimating the averages for each type, no regard has been paid to season or locality of growth, nor to the climatic or soil conditions of individual samples, as these may be considered as common to each type. In this table the arrangement of types is from highest to lowest in average content of nitrogen.

Burgundy, 33 samples	.072
Bordeaux, 55 samples	.070
North Italian, 34 samples	.066
Southern French, 61 samples	.064
Hungarian, 22 samples	.060

It is thus seen at a glance that the Burgundy and Bordeaux types are nearly equal in their content of nitrogen, and that while the variation in average amount of nitrogen in the musts for the several types is quite small, the Burgundy and Bordeaux types stand highest, while the Hungarian is lowest in the group.

Differences between Different Varieties.—In the five types chosen for these examinations there are embraced thirty-nine varieties of grapes, each variety being represented by samples grown under varying conditions; the averages may, therefore, be regarded as fairly comparable. They are arranged in the following table in order of highest to lowest:

AVERAGE AMOUNT OF NITROGEN IN GRAPE-VARIETIES.

Chauché noir, 7 samples	.107	Bonarda, 5 samples	.065
Refosco, 2 samples	.098	St. Macaire, 6 samples	.063
Cinsaut, 6 samples	.095	Barolo, 1 sample	.061
Pinot de Pernand, 6 samples	.088	Tannat, 6 samples	.060
Teinturier mâle, 6 samples	.088	Gamai Teinturier, 6 samples	.060
Petit Bouschet, 6 samples	.086	White Vernaccia, 4 samples	.060
Gros Verdot, 5 samples	.085	Mondeuse, 8 samples	.059
Kadarkas, 3 samples	.080	Fresa, 5 samples	.058
Blue Portuguese, 6 samples	.079	Meunier, 6 samples	.057
Petite Sirah, 2 samples	.075	Aramon, 7 samples	.055
Pinot St. George, 7 samples	.075	Spanna, 7 samples	.054
Barbera, 5 samples	.075	Grüner Velteliner, 3 samples	.054
Serine, 8 samples	.074	Carignane, 9 samples	.053
Crabb's Black Burgundy, 7 samples	.072	Robin noir, 7 samples	.051
César, 1 sample	.072	Grenache, 7 samples	.050
Cabernet Franc, 3 samples	.070	Dolcetto, 1 sample	.049
Malbeck, 7 samples	.069	Mataro, 8 samples	.043
Gros Mansenc, 7 samples	.069	Marzemino, 3 samples	.040
Rothgipfler, 3 samples	.068	Zinfandel, 4 samples	.039
Cabernet Sauvignon, 9 samples	.065		

In this table we have the two well-known varieties, Chauché noir and Zinfandel, standing respectively at the two extremes, and the former containing nearly three times the amount of nitrogen found in the Zinfandel; their respective types also occupy the same relative position with respect to that grouping. The rest of the table speaks for itself in showing the average content and the relative position of the varieties with respect to nitrogen.

Differences between Individual Samples.—In this comparison the effect of varying climatic and soil conditions, as well as that of maturity, is shown in the very great differences not only between samples of different varieties, but in some cases between those of the same variety.

In glancing over the table as it stands we find at one extreme the Chauché noir, No. 1620, from Tulare, with the highest percentage of nitrogen in its must, viz., 0.188, while at the other extreme we find the Tannat and Marzemino, Nos. 1835 and 1231, with but 0.014%. In other words, the maximum of nitrogen is more than fourteen times greater than the minimum. In the entire list of 209 there are but 19 which have as much as 0.100% of nitrogen. As a matter of interest we place in order the ten highest and lowest respectively:

Highest in Nitrogen.			Lowest in Nitrogen.		
No. 1620.	Chauché noir	.188	No. 1525.	Carignane	.026
No. 1434.	Cinsaut	.177	No. 1230.	Robin noir	.026
No. 1446.	Chauché noir	.165	No. 1820.	Cabernet Sauvignon	.025
No. 1943.	Teinturier mâle	.141	No. 1284.	Chauché noir	.025
No. 1614.	Cinsaut	.140	No. 2174.	Mondeuse	.022
No. 1681.	Gros Verdot	.138	No. 1257.	Zinfandel	.021
No. 1302.	Tannat	.125	No. 1249.	Grenache	.020
No. 1298.	Chauché noir	.117	No. 1823.	Gamai Teinturier	.016
No. 1584.	Refosco	.112	No. 1231.	Marzemino	.014
No. 1332.	Pinot St. George	.110	No. 1835.	Tannat	.014

The table simply shows that while a sample such as the Chauché noir may stand highest in the amount of nitrogen in its must, another sample of the same variety is one of the other extremes. Evidently, other causes or conditions than mere variety influence the assimilation of nitrogen.

Seasonal Variations in Nitrogen.—There is naturally some variation in the amount of nitrogen absorbed from year to year by the same variety upon the same soil, and the extent of that variation for some of the varieties is shown in the following table:

TABLE SHOWING EXTREME SEASONAL VARIATIONS IN ONE AND THE SAME VARIETY.

No.	Variety.	Locality.	Vintage.	Nitrogen Per Cent.	Variation.
	Bordeaux Type.				
1113	Cabernet Sauvignon	Mission San José	1889	.097	.037
1342	Cabernet Sauvignon	Mission San José	1890	.060	
1554	Cabernet Sauvignon	Paso Robles	1891	.076	.014
1914	Cabernet Sauvignon	Paso Robles	1893	.062	
1443	St. Macaire	Tulare	1891	.079	.003
1846	St. Macaire	Tulare	1893	.076	
1295	St. Macaire	Mission San José	1890	.070	.015
1706	St. Macaire	Mission San José	1892	.055	
1560	Tannat	Paso Robles	1891	.079	.019
1911	Tannat	Paso Robles	1893	.060	
1489	Malbeck	Paso Robles	1891	.081	.004
1917	Malbeck	Paso Robles	1893	.077	
1547	Gros Mansenc	Paso Robles	1891	.063	.030
2083	Gros Mansenc	Paso Robles	1893	.093	
	Burgundy Type.				
1258	Pinot de Pernand	Mission San José	1890	.100	.003
1504	Pinot de Pernand	Mission San José	1893	.097	
1508	Pinot St. George	Mission San José	1891	.083	.013
1910	Pinot St. George	Mission San José	1893	.070	
1428	Robin noir	Mission San José	1890	.056	.006
1953	Robin noir	Mission San José	1893	.062	
1446	Chauché noir	Tulare	1891	.165	.023
1620	Chauché noir	Tulare	1892	.188	
1557	Chauché noir	Paso Robles	1891	.070	.009
1868	Chauché noir	Paso Robles	1892	.079	
	Southern French Type.				
1438	Serine	Tulare	1891	.103	.006
1814	Serine	Tulare	1893	.109	
1488	Serine	Paso Robles	1891	.072	.017
1895	Serine	Paso Robles	1893	.089	
1151	Mondeuse	Cupertino	1889	.080	.028
1312	Mondeuse	Cupertino	1890	.052	
1142	Mondeuse	Mission San José	1889	.088	.017
1334	Mondeuse	Mission San José	1890	.071	
1447	Carignane	Tulare	1891	.058	.017
1628	Carignane	Tulare	1892	.065	
1887	Carignane	Tulare	1893	.075	
1527	Grenache	Paso Robles	1891	.070	.020
1721	Grenache	Paso Robles	1892	.050	
1529	Petit Bouschet	Paso Robles	1891	.091	.012
2009	Petit Bouschet	Paso Robles	1893	.079	
1436	Aramon	Tulare	1891	.055	.006
1639	Aramon	Tulare	1892	.061	

TABLE SHOWING EXTREME SEASONAL VARIATIONS IN ONE AND THE SAME VARIETY—Continued.

No.	Variety.	Locality.	Vintage.	Nitrogen Per Cent.	Variation.
	North Italian Type.				
1445	Barbera	Tulare	1891	.094	.019
1675	Barbera	Tulare	1892	.075	
1554	Nebbiolo, or Spanna	Paso Robles	1891	.067	.018
1954	Nebbiolo, or Spanna	Paso Robles	1893	.085	
1958	Nebbiolo, or Spanna	Paso Robles	1893	.074	
1437	Crabb's Black Burgundy	Tulare	1891	.081	.007
1615	Crabb's Black Burgundy	Tulare	1892	.088	
	Hungarian Type.				
1071	Zinfandel	Amador station	1889	.043	.022
1257	Zinfandel	Amador station	1890	.021	
1440	Blue Portuguese	Tulare	1891	.104	.014
1618	Blue Portuguese	Tulare	1892	.090	

About four fifths of the varieties of musts just tabulated above show, for different seasons, very little variation in nitrogen percentage. The greatest variation occurs in the Cabernet Sauvignon—0.037% difference between the seasons of 1889 and 1890, grown at Mission San José. The Gros Mansenc shows the next largest difference—0.030% for the years 1891 and 1893, at Paso Robles. The smallest difference—0.003%—is shown in the St. Macaire of the years 1891 and 1893, from Tulare:

Regional Variations.—In preparing the following table, showing the results by regions, we have taken an average of the figures for nitrogen in must recorded in the large table (A) above, where more than one analysis occurred for one locality. In order to show the differences between musts of the same varieties of grapes grown on different soils in localities differing climatically, we have tabulated the nitrogen results according to the *agricultural regions*. These regions are fully described in the Reports of 1888-89 and 1892 of this station; and that part of the description relating to climate and soil is, in part, given here in the following quotations:

"The *Bay region* constitutes a climatic as well as a hydrographic and topographic feature; for, insignificant as the break formed by the Golden Gate may seem, it modifies profoundly the climate of the country lying adjacent and opposite to it, not only by the influence of its cool tide-water, but as well by the corresponding cool lower air-currents sweeping through it almost throughout the season, and carrying with them both the temperature and the moisture of the ocean, both modified by the cold Alaskan current. In summer, the river of fog, a mile wide, may be seen flowing in steadily through the Gate in the afternoon, first submerging the City of San Francisco, and then broadening and sending off branches right and left, up and down the bay, and toward the evening reaching the opposite shore where the Contra Costa range forms a barrier for a time. * * * The direct influence of this current extends about ten miles each way on the opposite shore, causing an exceptionally low summer temperature, which fails to ripen the grape and fig. Mission San José is located outside of this fog district on the east side.

"On the western shore of the bay the high ranges of the immediate coast form a barrier not surmounted by a considerable portion of the summer fogs; under the lee of these a warmer summer temperature prevails on the bay shore slopes. Cupertino is located on this part, and thus does not wholly lie without the fog-influenced district of the west side of San Francisco Bay.

"The *Southern Coast Range Valley region* is represented by the Paso Robles station, on the east side of the main Coast Range, outside the fog belt of the coast region, at an elevation of nearly 1,000 feet. This locality represents one of great fluctuation in temperatures (for the year 1892–93 the mean daily range in temperature was 30.18°). The atmosphere is dry, but owing to altitude the rainfall is greater (about 14 inches against 6 inches), and the average temperature lower than in adjacent portions of the great valley.

"The division of the *Great Valley region* traversed by the San Joaquin River constitutes about three fifths of the whole. The climate of the San Joaquin Valley stands in marked contrast to that of the immediate coast of California, and most markedly with that of the bay region contiguous to the Golden Gate. A very light rainfall, a very dry atmosphere, especially in summer (mostly below 50% of saturation), and a summer temperature which by the thermometer is very high, but which, in consequence of the dryness of the air, is but rarely oppressive, constitute the main factors of the climate of the interior valley.

"The climate of the *Sierra Foothill region* may be roughly said to be similar, as to temperature, to that of the adjacent portion of the Great Valley up to about 1,500 feet in its northern, and up to 2,000, and even more, in the southern part. Here, as in the valley, snow lies in the winter only for a few hours, or days, if it falls at all, and the fig and citrus fruits flourish. The summers are warm, the temperature very commonly rising into the nineties in the daytime; but, owing to the dryness of the air, this temperature is not oppressive, the more as the nights are always cool."

Nitrogen Contents of the Soils of the Several Regions.—Nitrogen occurs in soils in several combinations: in the humus in organic form, in the nitrates, and in the ammonia and ammoniacal salts. The soils of the several regions have been examined for nitrogen by this Station,* with results as shown in the following table:

NITROGEN IN SOILS OF VARIOUS REGIONS.

Region.		Humus Nitrogen, per cent on Soil.	Sodium Nitrate, ready-formed.
Sierra Foothills	Amador County, slate soil	0.090	------
	Amador County, granitic soil	0.100	------
Great Valley	Fresno, granitic soil	0.112	------
	Tulare, light sandy soil	0.062	0.067
Bay	Mission San José, heavy calcareous adobe soil	0.088	------
	Cupertino, gravelly clay loam soil	0.067	------
Southern Coast Range Valley	Paso Robles, sandy loam soil	0.100	------

*"On the Nitrogen Contents of Soil Humus in the Arid and Humid Regions," by E. W. Hilgard and M. E. Jaffa, Report of Agricultural Experiment Stations, California, 1892-93-94, page 66. The nitrogen in the Cupertino soil has recently been determined by R. A. Gould, of the Agricultural Laboratory

Thus, the soils upon which the grapes under consideration were grown show some differences in soil nitrogen, especially that part contained in the organic form—that is, in the humus. The soils from Amador, Fresno, Paso Robles, and Mission San José all carry in the neighborhood of 0.100% of organic nitrogen. Those of Cupertino and Tulare resemble each other in this respect, having upward of 0.060% of organic nitrogen. But the Tulare soil possesses, in addition to its organic nitrogen, a supplement of nitrogen in the form of sodium nitrate (0.067% equivalent to 0.011% of nitrogen), wherein it differs from the soils of all the other regions. The introduction of the subject of soil nitrogen at this point is not, of course, to enforce any hard and fast rules relating to its influence upon grapes, because the data are insufficient and the whole subject is, as yet, a study.

TABLE B.—Differences in Nitrogen between Musts from the Same Varieties of Grapes Grown in Different Regions.

VARIETIES.	Foothills Region.	Great Valley Region.		Bay Region.			Coast Range Valley Region.
	Amador Co.	Fresno.	Tulare.	East Side, Mission San José.	West Side, Cupertino.	Napa Valley, Asti.	Paso Robles.
Bordeaux Type.							
Cabernet Sauvignon	.025	.036	.071	.077	.082		.069
Cabernet Franc				.088	.042		.080
Gros Verdot		.059	.138	.098	.041		.091
Malbeck	.037	.063	.070	.092	.053		.079
Tannat	.014		.041	.125	.037		.070
Teinturier mâle	.064	.063	.141	.102	.066		.092
Gamai Teinturier	.016	.039	.089	.080	.047		.082
St. Macaire	.041		.077	.063	.056		
Burgundy Type.							
Pinot de Pernand		.101	.094	.098	.067		.074
Pinot St. George	.040	.083	.057	.076	.110		.067
Meunier	.043	.060	.063	.087	.043		.047
Chauché noir	.030		.176	.117	.065		.074
Robin noir	.033	.026	.045	.059	.025		.104
Southern French Type.							
Petite Sirah					.065		.085
Serine	.051	.055	.106	.088	.061		.081
Mondeuse	.022		.056	.079	.066		.068
Cinsaut	.044		.155	.095	.056		.077
Mataro	.040	.035	.042	.029	.049		.076
Carignane	.032	.026	.066	.100	.050		.049
Grenache	.032	.020	.064		.053		.060
Petit Bouschet		.097	.060	.100	.094		.079
Aramon	.040	.035	.058	.081	.060		.055
César						.072	
Austrian and Hungarian Type.							
Zinfandel	.032	.045					
Blue Portuguese		.057	.097	.087	.061		.077
Rothgipfler	.065			.063			.077
Marzemino		.014		.042	.065		

TABLE B.—Differences in Nitrogen between Musts from the Same Varieties of Grapes Grown in Different Regions.—Continued.

Varieties.	Foothills Region.	Great Valley Region.		Bay Region.			Coast Range Valley Region.
	Amador Co.	Fresno.	Tulare.	East Side, Mission San José.	West Side, Cupertino.	Napa Valley, Asti.	Paso Robles.
Austrian and Hungarian Type—Continued.							
Grüner Velteliner		.041		.075	.047		
Kadarkas		.064		.107	.071		
North Italian Type.							
Gros Mansenc	.034	.050	.088	.087	.056		.079
Fresa	.034	.059	.049		.065		.086
Barbera			.084	.065	.085	.057	
Spanna, or Nebbiolo	.034				.042	.037	.078
Refosco				.112	.084		
Crabb's Black Burgundy		.081	.084	.091	.057	.042	.068
Dolcetto						.049	
Barolo						.064	
Bonarda			.071		.059		.079

A study of the figures in the table, as a whole, shows that the musts of grapes from Mission San José (Bay region) and Tulare (Great Valley) are the highest in nitrogen; those from Paso Robles in the Coast Range Valley stand second; those from Cupertino (on the west side of the Bay region) and those from Fresno (in the Great Valley) are third, while those from Amador (of the Foothills region) are the lowest in nitrogen. This is shown in the following table:

Must.	Mission San José.	Tulare.	Paso Robles.	Cupertino.	Fresno.	Amador Station.
Gros Verdot	.098	.138	.091	.041	.059	----
Tannat	.125	.041	.070	.037	----	.014
Chauché noir	.117	.176	.074	.065	----	.030
Robin noir	.059	.045	.104	.025	.026	.033
Petite Sirah	.088	.106	.081	.061	.055	.051
Aramon	.081	.058	.055	.060	.035	.040
Blue Portuguese	.089	.097	.077	.061	.057	----

It is interesting to compare results between Mission San José and Cupertino, two points comparatively few miles from each other in the same valley or Bay region, but situated respectively on the east and west side, and which possess some climatic differences.

Of the thirty-two different varieties of musts analyzed from these places, those from Mission San José contain the highest percentage of nitrogen in all but five samples, viz.: Cabernet Sauvignon, Pinot St. George, Mataro, Marzemino, and Barbera. In many instances the percentage of nitrogen is twice, and sometimes three times, that found in the Cupertino samples.

It might be expected, too, that the Fresno soil, situated as it is in the hot climate, where nitrification is most intense, would yield musts containing at least as much nitrogen as those from Tulare, in the same region. But the figures do not bear this out. Tulare musts rank in nitrogen, in almost every variety, far above those from Fresno.

These differences cannot be explained by the facts heretofore given relating to the soil nitrogen, for we find that both the light, sandy soil of Tulare and the heavy adobe of Mission San José have relatively small amounts of soil nitrogen to produce grape musts which are richest in nitrogenous matters. The foothill granite soil, with quite as much soil nitrogen as either the loamy soil of the Coast Range valleys or the granite soil of Fresno, fails in nearly every case to produce musts which even approach in nitrogenous matters those of the above districts. The foothill station soil in other respects, too, gives rather poor results with grape-varieties. The soil seems to be too dry to give good crops. From these facts before us, it seems that the nitrogen withdrawn by grapes and held in their musts does not stand in any direct relation to the total of the nitrogen contained in the soil itself.

European Analyses.—Some nitrogen determinations in musts from grapes grown in Europe have come under our observation. We give below part of the results obtained from those grown at the St. Michele Experiment Station, in Austria, and reported in "Landw. Versuchs. Stationen Nos. 36 and 41, Über den Gehalt an stickstoffhaltigen Substanzen in Trauben aus dem Anstaltsgute in St. Michele," by E. Mach and K. Portele.

NITROGEN IN EUROPEAN AND CALIFORNIA MUSTS.

	Vintage.	*Austrian Musts.	California Musts.
		Nitrogen Per Cent.	Nitrogen Per Cent (Average).
Cabernet Sauvignon	1891	.049	----
Cabernet Sauvignon	1889	.049	----
Cabernet Sauvignon	1889	.060	.065
Carbernet Franc	1889	.063	.070
Cabernet Franc	1888	.046	----
Merlot	1889	.037	----
Blauer Burgunder (Pinots)	----	.056	.081
Kadarkas	1889	.045	----
Kadarkas	1888	.027	.080
Lagrain	1889	.056	----
Lagrain	1888	.036	----

*Landw. Versuchs. Stationen (No. 41, 1892).

It will, of course, be borne in mind that the California grapes were not fertilized, while those at the Austrian station were, though perhaps not more than would offset the natural richness of our soils. Still, the Austrian varieties hardly show, on the whole, as much nitrogen as do our California musts. We notice, however, in the work referred to, that some of the Eastern American grapes grown at St. Michele yield some pretty high nitrogen percentages; namely, Jacquez (Lenoir), with 0.081%, and Herbemont, with 0.091%.

EXAMINATION OF THE WINES.

Of the one hundred and thirteen wines studied for this investigation and shown in Table A, quite one hundred were made in the viticultural cellar at this station; the remainder are marked as sent for examination. These station wines were all analyzed at the same age—from four to six months from making, or after being racked the second or third time. Their condition at that age, as recorded in this and previous viticultural reports, was generally *good*, the wines being bright, *i. e.*, having become cleared.

Nitrogen in Wines—Differences between Different Types.—The following table shows how the wines of the different types compare in their averages in nitrogen contents. Alongside of these we give the figures for the corresponding musts:

Type.	WINE.		MUST.		Nitrogen Lost during Fermentation. Per Cent.
	Number of Analyses.	Nitrogen Per Cent.	Number of Analyses.	Nitrogen Per Cent.	
Bordeaux	36	0.043	55	0.070	38.50
Burgundy	7	0.044	33	0.072	38.80
Southern French	44	0.037	61	0.064	42.20
Northern Italian	15	0.037	34	0.066	43.60
Austrian and Hungarian	11	0.036	22	0.060	40.00

The Bordeaux and Burgundy types of wines lead, as do their musts, in nitrogen. The other types—Southern French, North Italian, and Hungarian—show small differences between themselves, and here, again, they resemble their corresponding musts.

Differences between Varieties.—Comparing the averages of the varieties we find the Cinsaut, with its 0.090%, and the Chauché noir, with 0.071%, to rate highest, as is shown in the following table, in which nine of each extreme are given:

HIGHEST.			LOWEST.		
Variety.	Wine.	Must.	Variety.	Wine.	Must.
Cinsaut	.090	.132	Bonarda	.033	.063
Chauché noir	.071	.128	Aramon	.029	.059
Refosco	.056	.112	Grenache	.028	.043
Cabernet Sauvignon	.056	.073	Dolcetto	.027	.049
Gamai Teinturier	.055	.069	Zinfandel	.026	.039
Kadarkas	.054	.089	Pinot St. George	.026	.055
Nebbiolo or Spanna	.052	.085	Carignane	.025	.053
Petite Sirah	.052	.....	Velteliner	.021	.058
Pinot de Pernand	.050	.100	Mataro	.017	.041

It is worthy of note that in the vinification, the Cinsaut lost camparatively little of its nitrogen, while the Chauché noir lost one third, and the Refosco still more. In the varieties with low nitrogen percentages the proportionate loss is still greater in some instances. Thus, the Grüner Velteliner and the Carignane have fallen more than one half, while of the Pinot St. George but one third of the original remains.

Differences between Individual Wines.—It does not follow, as a matter of fact, that the musts that contain the highest amount of nitrogen would give a wine which also ranks highest in the same; for the loss in vinification is unequal for the different samples. This is shown in the following table, in which ten samples at each extreme of nitrogen percentages have been compiled from the large general table first given:

HIGHEST.			LOWEST.		
Variety.	Wine.	Must.	Variety.	Wine.	Must.
No. 1434. Cinsaut	.124	.171	No. 1243. Gros Mansenc	.016	.050
No. 1620. Chauché noir	.105	.188	No. 1189. Aramon	.015	.....
No. 1614. Cinsaut	.093	.140	No. 1255. Mataro	.015	.036
No. 1113. Cabernet Sauvignon	.089	.097	No. 1253. Zinfandel	.015	.030
No. 1418. Kadarkas	.076	.107	No. 1257. Zinfandel	.013	.021
No. 1497. Teinturier mâle	.074	.092	No. 1252. Mataro	.011	.035
No. 1142. Mondeuse	.073	.088	No. 1246. Aramon	.011	.035
No. 1302. Tannat	.068	.125	No. 1189. Aramon	.010	.....
No. 1814. Serine	.067	.109	No. 1525. Carignane	.010	.026
No. 1618. Blue Portuguese	.067	.090	No. 1251. Carignane	.007	.026

The difference between the two extremes represented by Cinsaut and Carignane, respectively, is very great, the latter having but about one eighteenth as much nitrogen as the former. The great majority of the

one hundred and thirteen samples of wines examined contain less than 0.050% of nitrogen.

Variations by Seasons.—It is interesting to note the differences in nitrogen contents that occur in wines from grapes of the same variety grown on the same plot in two consecutive seasons, and for convenience of comparison some of these are presented in the following table:

NITROGEN OF SOME VARIETIES OF WINE FROM GRAPES GROWN ON SAME PLOT IN DIFFERENT YEARS.

No.	Variety.	Locality.	Vintage.	Nitrogen Per Cent.	Variation.
1113	Cabernet Sauvignon	Mission San José	1889	.089	.047
1342	Cabernet Sauvignon	Mission San José	1890	.042	
1295	St. Macaire	Mission San José	1890	.023	.003
1706	St. Macaire	Mission San José	1892	.026	
1058	Gamai Teinturier	Mission San José	1889	.049	.005
1294	Gamai Teinturier	Mission San José	1890	.044	
1042	Serine	Fresno	1889	.044	.017
1242	Serine	Fresno	1890	.027	
1151	Mondeuse	Cupertino	1889	.056	.040
1312	Mondeuse	Cupertino	1890	.016	
1142	Mondeuse	Mission San José	1889	.073	.045
1334	Mondeuse	Mission San José	1890	.028	
1069	Mataro	Amador station	1889	.021	.006
1255	Mataro	Amador station	1890	.015	
1628	Carignane	Tulare	1892	.031	.004
1887	Carignane	Tulare	1893	.035	
1189	Aramon	Cupertino	1889	.015	.018
1414	Aramon	Cupertino	1890	.033	
1175	Aramon	Mission San José	1889	.042	.004
1377	Aramon	Mission San José	1890	.046	
1071	Zinfandel	Amador station	1889	.028	.015
1257	Zinfandel	Amador station	1890	.013	
1098	Zinfandel	Fresno	1889	.047	.032
1253	Zinfandel	Fresno	1890	.015	

As with the musts, so we find with the wines that the variations in nitrogen between two seasons for the same grape is in some cases very great and in others quite small. This is most noticeable in the Aramon, which at Cupertino differed by 0.018% for the seasons of 1889 and 1890, while at Mission San José for the same seasons the difference was only 0.004% of nitrogen. The Mondeuse, on the contrary, shows about equal differences (0.040% and 0.045%) for each of those localities. The Zinfandel also has a greater variation at Fresno than at Amador.

Effect of Nitrogen on the Keeping Quality of Wines.—The wines reported in the tables above were all made in the same manner; namely, by fermentation in open tanks, but covered with a floating cover and stirred twice a day, the outside temperature being kept at 75° F. We

have already noted the differences between the different types of wines and their corresponding musts, but without reference to the *keeping qualities* of the wines. The types, from records here, when considered from the latter point of view, may be classified again: Bordeaux, *good keepers*; Burgundy, *not very good*; Southern French, *only fair*, on the whole; North Italian, *keeps very well*, as far as known; and the Hungarian, *rather well*. We find that the Bordeaux and Burgundy wines, which represent the extremes of both good and poor keepers, have in vinification each retained the largest part of their original nitrogenous matters. While the other types, viz.: Southern French, North Italian, and Hungarian, which are better than the Burgundy, have also retained about the same amount of their original nitrogen.

Among the *varieties* the Cinsaut, 0.090%, and Chauché noir, 0.071% of nitrogen, which are not rated as good keepers, average the highest in nitrogen-holding power, although having lost respectively 31.8% and 44.0% of their initial nitrogen.

The Cabernet Sauvignon, Refosco, Gamai Teinturier, and Spanna, with next highest nitrogen content, are all good keepers; the Petite Sirah, an exception to its type in being a good keeper, ranks with these in its nitrogen.

Of the wines retaining 0.050% of nitrogen (corresponding to 0.312% of albuminoids), the poor keepers are predominant, as represented by Pinot de Pernand, Robin noir, Serine, Petit Bouschet; and the Teinturier mâle, Verdot, and Tannats representing the better class.

The low nitrogen-holding varieties of wine (averages) are easily seen to be mostly in the class of wines with poor keeping qualities, as represented by the Pinot St. George, Carignane, and Grenache; however, the Zinfandels, good keepers, come in just at this point.

Of the *individual samples* we find that both the highest and the lowest nitrogen-holders belong to the class of wines of poor keeping qualities: The Cinsaut, No. 1434, retained 0.124% of nitrogen or 0.758% of albuminoids; the Chauché noir, No. 1620, 0.105% of nitrogen, corresponding to 0.656% of albuminoids. These have about ten times more albuminoids than the Carignane (Nos. 1251 and 1525), Mataro (No. 1252), Aramon (Nos. 1246 and 1189), and Pinot St. George (No. 1819), all with 0.010% of nitrogen or 0.063% of albuminoids; these, too, are poor keepers, or hard to keep until full maturity without special precautions. No. 1312, Mondeuse, with 0.016% of nitrogen or 0.100% of albuminoids, is an exception to its type, in being a good keeper; No. 1243, Gros Mansenc, with the same amount of nitrogen, keeps well also.

The large number of wines intermediate between the extremes just discussed are quite evenly distributed between good and only fair keepers; occasion to study them more fully will be taken when we refer to the influence of locality upon their nitrogen contents.

From the foregoing we are able to emphasize our first conclusion: that the inference is rather against the significance of the *amount* of nitrogen present as controlling the keeping qualities of wines. This is shown especially in samples of the Mondeuse, which, in 1889, had a high content of nitrogen, and in 1890 a very low percentage, and yet their records show that they were in each case both very fair keepers. The influence, so far as it goes, probably lies more in the direction of the *quality* than of the *quantity* of nitrogenous ingredients.

Influence of Locality.—For the purpose of considering the influence of locality upon the nitrogen held in wines of the same and different varieties, we group them according to regions in the accompanying large table, which shows the nitrogen per cent in the must and the wine, and the differences between the must and the wine expressed in figures for absolute amount, and per cent upon original nitrogenous contents.

The differences in the nitrogenous matters of the musts and wines for localities may, for convenience, be stated in this general way, from the results shown by the table: The wines of the Foothills region (average of 6 samples) have lost 50% during fermentation, those of the Valley (average of 27) 41.90%, of the Bay (average of 44) 46.80%, and of the Coast (average of 15) 43.60% of their initial nitrogen. However, as these figures relating to wine are based upon extremely variable results for the different regions, even the differences between the same wines grown in any one locality are notable, so that it becomes quite necessary to examine some of the results carefully.

Take, for instance, the Teinturier mâle from the three greater districts; we find the Coast sample of wine, No. 1497, to have been deprived of 19.50% of its original nitrogen during fermentation, as against 43.20% for the Bay wine, No. 1292, and 54.10% for the Valley wine, No. 1205.

The Gros Mansenc of the three regions, on the whole, offers an example of rather similar figures in loss of nitrogenous matters, viz.: Valley, 56%; Bay, 53%; Coast, nearly 48%. The Chauché noirs from Bay and Coast Range valleys have parted with rather more nitrogen than the Valley wine, for they show a little over 50% loss as against 44.10%; the must of the Chauché noir of the Valley contained 0.108% of nitrogen, that from the Bay 0.117%, and that from the Coast Range valleys 0.079%—all high quantities.

The Serine wines of the various localities are rather constant than otherwise in loss of nitrogenous matters, as witness: Coast, 42.50%; Bay, 46.90%; and Valley, average, 45.0%—with quite similar and high amounts in their musts.

The Mondeuse wines from the Bay region are very erratic, losing all the way from 17% to 60% of nitrogenous matters, but averaging about 50%, as against 57% for the Valley and 47% for the Coast Range valleys.

The Mataros, with the exception of those of the Coast Range valleys, began fermentation with quite similar amounts of nitrogenous matters, and yielded, in the end, wines with some variations for the separate regions; the Foothill and Bay musts have lost about 56%, the Valley and Coast, each upward of 69%.

Of the Aramons, the Valley samples of wine have lost the largest amount of nitrogenous matters during fermentation, averaging over 57% loss; the Bay and Coast lots have retained more of the ingredients, having lost, respectively, 43.30% and 45%. Crabb's Black Burgundy (Refosco) shows the Coast wine to hold much more nitrogenous matter than the Bay or Valley wines of this name; and we may call attention to the fact that the Bay district presents rather wide ranges in nitrogen of musts, and also in amount of nitrogen retained after fermentation.

The Zinfandel wines from the Valley differ greatly in nitrogen eliminated during fermentation, No. 1098 having lost about one fourth and No. 1253 just one half; the Foothill wines, on the other hand, show more uniform loss, and average 36.70% loss.

Thus it appears that in carrying this work forward we have found

TABLE C. NITROGEN IN WINES OF DIFFERENT REGIONS.

Serial Number	VARIETIES	SIERRA FOOTHILLS REGION				GREAT VALLEY REGION								BAY REGION								COAST RANGE VALLEY REGION			
		AMADOR STATION				FRESNO				TULARE				MISSION SAN JOSE				CUPERTINO				PASO ROBLES			
		Nitrogen Per Cent		Differences in Must and Wine		Nitrogen Per Cent		Differences in Must and Wine		Nitrogen Per Cent		Differences in Must and Wine		Nitrogen Per Cent.		Differences in Must and Wine		Nitrogen Per Cent		Differences in Must and Wine		Nitrogen Per Cent		Differences in Must and Wine.	
		In Must	In Wine	Absolute	Per Cent	In Must	In Wine	Absolute	Per Cent	In Must	In Wine	Absolute	Per Cent	In Must	In Wine	Absolute	Per Cent	In Must	In Wine	Absolute	Per Cent	In Must	In Wine	Absolute	Per Cent.
	Bordeaux Type.																								
1113	Cabernet Sauvignon													097	089	008	8.2								
1342	Cabernet Sauvignon													060	042	.018	30.0								
1765	Cabernet Sauvignon													075	038	.037	49.3								
1914	Cabernet Sauvignon																					.062	.055	007	11.2
1382	Gros Verdot													098	052	046	46.9								
1797	Malbeck									070	053	017	24.2												
1917	Malbeck																					077	.047	030	38.9
1302	Tannat													125	068	057	45.6								
1911	Tannat																	060	026	.034	56.6				
1283	Teinturier mâle																	.066	035	.031	47.0				
1205	Teinturier mâle					063	029	034	55.5																
1497	Teinturier mâle																					092	074	018	19.5
1292	Teinturier mâle													102	058	044	43.1								
1276	Gamai Teinturier																	.047	023	024	51.0				
1294	Gamai Teinturier													080	044	036	45.0								
1866	Gamai Teinturier																					082	043	039	47.5
1281	St. Macaire																	.056	.024	.032	57.1				
1295	St. Macaire													070	023	047	67.1								
1700	St. Macaire													055	026	.029	52.7								
1846	St. Macaire									076	041	035	46.0												
	Burgundy Type.																								
1258	Pinot de Pernand													100	050	050	50.0								
1910	Pinot St. George													070	033	037	52.8								
1819	Pinot St. George	040	019	021	52.5																				
1298	Chauche noir													117	056	061	52.0								
1868	Chauche noir																					079	038	041	52.0
1620	Chauche noir									188	105	083	44.1												
1953	Robin noir													062	049	.013	20.9								
	Southern French Type.																								
1141	Serine													088	047	041	46.6								
1242	Serine					055	027	028	51.1																
1814	Serine									109	067	042	38.5												
1896	Serine																					089	054	035	39.3
1312	Mondeuse																	052	016	.036	69.2				
1151	Mondeuse																	080	056	024	30.0				
1142	Mondeuse													088	.073	015	17.0								
1534	Mondeuse													.071	028	043	60.5								
1888	Mondeuse									056	024	032	57.1												
1922	Mondeuse																					068	.036	032	47.0
1408	Cinsaut													095	053	042	44.2								
1434	Cinsaut									171	124	047	27.4												
1611	Cinsaut									140	093	047	33.5												
1069	Mataro	045	021	024	53.3																				
1257	Mataro	036	015	.021	58.3																				
1609	Mataro																	049	.019	030	61.2				
1610	Mataro													029	010	019	65.5								
1252	Mataro					035	011	024	68.5																
1921	Mataro																					076	023	053	69.7
1070	Carignane	032	011	021	65.6																				
1251	Carignane					026	007	019	73.1																
1628	Carignane									065	031	034	52.3												
1576	Carignane																					.049	033	016	32.6
1877	Carignane									075	035	040	53.3												
1249	Grenache					020	015	005	25.0																
1626	Grenache									080	041	039	[illegible]												
1721	Grenache																					050	.028	022	44.0
1378	Petit Bouschet													100	052	.048	48.0								
1455	Petit Bouschet									060	045	015	25.0												
2009	Petit Bouschet																					079	.051	028	35.4
1414	Aramon																	060	033	.027	45.0				
1377	Aramon													081	046	035	43.2								
1245	Aramon					035	011	024	68.5																
1630	Aramon									061	032	029	47.5												
	Austrian and Hungarian Type.																								
1262	Blue Portuguese													087	042	045	51.7								
1206	Blue Portuguese					057	025	032	56.1																
1618	Blue Portuguese									090	067	023	25.5												
1346	Gruner Veltliner													075	025	050	66.6								
1208	Gruner Veltliner					041	017	024	58.5																
1307	Kadarkas																	071	032	039	54.8				
1418	Kadarkas													107	076	.031	28.9								
1098	Zinfandel					061	047	014	22.9																
1253	Zinfandel					030	015	015	50.0																
1071	Zinfandel	043	028	015	34.8																				
1257	Zinfandel	021	013	008	38.0																				
	North Italian Type.																								
1573	Barbera													065	034	031	47.7								
1675	Barbera									075	032	043	57.3												
1954	Nebbiolo, or Spanna																					085	052	.033	38.8
1584	Refosco													112	056	056	50.0								
1318	Crabb's Black Burgundy																	.057	.030	.027	47.3				
1343	Crabb's Black Burgundy													.091	041	050	54.9								
1615	Crabb's Black Burgundy									.088	040	048	54.4												
1496	Crabb's Black Burgundy																					068	.047	021	30.8
1384	Bonarda																	055	023	032	58.1				
1362	Bonarda																	.055	.035	020	36.3				
1809	Bonarda																					079	045	034	43.0
1277	Gros Mansenc																	056	.028	028	50.0				
1330	Gros Mansenc													.087	038	049	56.3								
1243	Gros Mansenc					050	016	034	68.0																
1899	Gros Mansenc									088	049	.039	44.3												
2083	Gros Mansenc																					.093	049	.044	47.3

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The Zinfandel wines from the Valley differ greatly in nitrogen nated during fermentation, No. 1098 having lost about one fourt No. 1253 just one half; the Foothill wines, on the other hand, more uniform loss, and average 36.70% loss.

Thus it appears that in carrying this work forward we have

abundant examples to verify the earlier statements in regard to the influence of climate and soil upon the nitrogen contained in grape musts, viz.: "that while climate exerts a material influence upon the nitrogen contents of all grape musts, and especially upon the loss of nitrogen in vinification, a very great influence must also be ascribed to the soil, although the differences are not equal, or proportional, in different grape-varieties. It does not appear that the total amount of nitrogen present in grape musts bears any direct relation to the known keeping qualities of the wines, whether we compare different varieties, or the same variety from different localities." And until we have determined in what condition the nitrogen exists in wines, it is impossible to specify the influence, if any exists, that nitrogenous matters have upon the conservation of wines. The subject is an exceedingly complicated one, because, as yet, there is no reliable method for the separation of the various nitrogenous bodies known as "albuminoids," peptones, amides, etc.

THE INFLUENCE OF DIFFERENT METHODS OF VINIFICATION UPON THE NITROGENOUS CONTENTS OF WINES.

This is illustrated in the results given in the following table. These experiments, an account of which was published separately in 1888 (see "Report of Experiments on Methods of Fermentation"), showed amazing differences in composition as the result of varying the methods of vinification. Without entering upon the details of these methods, some salient points may be mentioned.

The material employed was Carignane grapes from Mission San José, Alameda County, the locality which in the preceding discussion has been found to produce wines so exceptionally rich in nitrogenous compounds. It did not belie its reputation with the Carignane used, which, when vinified according to our usual method (in open tank with floating cover and twice-daily stirring, and outside temperature of 75° F.), showed 0.081% of nitrogen against 0.011% found in the wine of the same grape grown in Amador County—an enormous difference.

TABLE D.

DETERMINATION OF NITROGEN (*Resp.* "ALBUMINOIDS") IN WINES (CARIGNANE, AGE 2½ YEARS) FROM EXPERIMENTAL FERMENTATIONS, VINTAGE OF 1887.*

Number.	Mode of Fermentation.		Nitrogen.	"Albuminoids."
			(March, 1890.)	
795	Floating cover, twice-daily stirring, 90°–95° F.		.098	.613
787	Floating cover, twice-daily stirring	72°–75° F.	.081	.508
788	Single frame, near top of mash		.099	.619
789	Single frame, near middle of mash		.102	.638
790	Single frame, pumping over the wine from below		.085	.531
791	Three frames, at different heights		.095	.594
792	No cover, twice-daily stirring		.096	.600
793	No cover, stirring by pumping air		.077	.481
794	"Morel process" (whole grapes)		.088	.551
796	Floating cover, twice-daily stirring, 62° F.		.097	.606

*See Report on "Experimental Fermentations," 1888.

The maximum of nitrogen (0.102%) was found in the wine made according to the somewhat laborious, but thoroughly rational, method of keeping the pomace-cap submerged far below the surface of the liquid (No. 789), preventing acetification, and producing a wine of markedly good character, both as to bouquet, softness, and keeping qualities. The minimum (0.077%) was obtained when employing a rather excessive amount of aëration, by not only leaving the surface of the wine exposed, but also pumping air through it thrice daily, instead of stirring with the usual implement (No. 793). That this aëration brings about a precipitation of nitrogenous substances has been known ever since the experiments on the D'Heureuse method of defecating vegetable juices, and was to be expected in this case. But owing to the excessive exposure to the air, the wine so prepared of course did not keep well.

The relative effect of *lack of aëration* is shown also in the result of the process (No. 788), in which a single grated frame is made to hold the pomace-cap near the surface of the liquid, although submerged; no stirring being done, and therefore no aëration beyond what occurs at the surface, where the small amount of fluid retained there usually becomes acetified. Its nitrogen percentage (0.099) is greater by 0.018 than that of the wine made by our usual process (No. 787), which received a moderate amount of aëration by stirring.

The most unexpected result shown in the table is that of the fermentation at the high temperature of 90° to 95° F., which gave to the resulting wine the same amount of nitrogenous matter as the one conducted, otherwise similarly, but at the temperature of only 62° F. It has been thought that the higher temperature might tend to the dissolution of more albuminoids, and that this might have some connection with the poor keeping qualities of the wines produced, under the influence of heat, in warm climates; but this experiment seems to prove that this is not the case.

NITROGEN IN CALIFORNIA WINES OF MORE ADVANCED MATURITY THAN THE ABOVE.

Below, in the small table, is given the nitrogen contained in California wines exhibited at the World's Columbian Exposition, at Chicago; analyzed by Mr. W. H. Krug, of the U. S. Agricultural Department, Chemistry Division, Washington, D. C.:

NITROGEN IN OLDER CALIFORNIA WINES.

Wine.	Nitrogen.		"Albuminoids."	
	Maximum.	Minimum.	Maximum.	Minimum.
Zinfandel	0.084%	0.028%	0.525%	0.175%
Clarets	0.093	0.027	0.580	0.169
Cabernet	0.081	0.030	0.506	0.188
Malbeck	0.091	0.048	0.556	0.030
Medoc	0.058	0.039	0.363	0.238
Burgundy	0.074	0.030	0.450	0.188
Mataro	0.093	0.025	0.581	0.156
Barbera	0.032		0.200	
Barolo	0.014		0.094	
Mondeuse	0.034		0.213	

No accurate comparison, on account of differences of age, can be made between these results and most of those in Table A. However, the results for the older wines show, like the very young ones, wide differences in their nitrogen. The Cabernets from Gubserville, noted elsewhere as exceptions in point of age, are comparable with those analyzed by Mr. Krug. In the series embracing 1632R to 1635R, Table A, the nitrogen varies from 0.035% to 0.057%, as against 0.030% to 0.081% for those examined in Washington, from various California localities.

Taking the oldest Cabernet wines, vintage of 1885, of both series examined for nitrogen, we find for that from Gubserville 0.041%, as against 0.037% of nitrogen in that from Napa, No. 12762 of the analysis by Mr. Krug.

NITROGEN IN SOME EUROPEAN WINES.

The following list comprises some of the determinations of nitrogen in wine of various European sources. Selection has been made with a view to comprehend some similarity of *type* and *variety* between these and the California wines examined. But, on account of great difference in age of the wines examined, the comparisons we can make are necessarily not very accurate.

NITROGEN IN SOME EUROPEAN WINES.

Name and Source of Wine.	Nitrogen Per Cent.	Name and Source of Wine.	Nitrogen Per Cent.
**French Wines.*		†*Italian Wines.*	
Grand wines: Côtes rôties	.042	Nebbiolo	.011
Grand wines: Pouilly	.081	Nebbiolo	.012
Grand wines: Pomard	.050	Bonarda	.017
Grand wines: Pomard	.074	Dolcetto	.010
Grand wines: Beaune	.054	Dolcetto	.017
Grand wines: Closvougeot	.080	Dolcetto	.013
Grand wines: Richebourg	.052	Pinot	.001
Grand wines: Nuits Saint George	.127	Barbera	.007
Grand wines: Nuits Saint George	.124	Barbera	.014
Grand wines: Nuits Saint George	.106	Barbera	.017
		Barbera	.020
Common wines: Alicante	.016	§*Tyrol Wines* minimum	.030
Common wines: Narbonne	.009	§*Tyrol Wines* minimum	.012
Common wines: Gamai Beaune	.024	§*Lower Austria Wines* maximum	.030
Common wines: Bouschet Mouvèdre d'Arles	.001	§*Lower Austria Wines* minimum	.023
Common wines: Aramon (Arles)	.001	§*Dalmatia Wines* maximum	.030
Common wines: Carignane (Arles)	.001	§*Dalmatia Wines* minimum	.011
Common wines: Carignane (Arles)	.003	§*Hungarian Wines* maximum	.045
Common wines: Carignane (Arles)	.001	§*Hungarian Wines* minimum	.010
Common wines: Petit Bouschet (Arles)	.001	‡*Austrian Wines.*	
Common wines: Alicante Bouschet	.001	Cabernet	.016
		Kadarkas	.017
		Marzemino	.018

*From "Étude sur la fermentatiou alcoolique du vin," par V. Martinand; Marseilles, 1895.
†"Ministero di Agricoltura, Industria E Commercio"; Italy; Report of 1896.
§Appendix B, Report of State Viticultural Commission, 1893-94. (Extracts from Report U. S. Dept. of Agr., Washington.)
‡Landw. Versuchs. Stationen, No. 36, 1889.

The French wines designated as *Grand Wines* by V. Martinand all carry high nitrogen percentages, while those named by him *Common Wines* are all low in that respect. The latter class seem to resemble, in low nitrogen contents, the wines of Austria and Italy, as given above.

As far as it is possible to compare the figures just above for the European wines with those in Table A, we can say that, with the exception of the high-grade French wines, the nitrogen of the California wines seems to be much higher, on the whole, than that contained in wines produced in the eastern and southern grape-growing regions of Europe. In northern Europe, too, this seems to hold, for the nitrogen, as far as observed, ranges from 0.010% to near 0.030%.

SUMMARY.

(*a*) *Musts.*—(1) The variation in average amount of nitrogen in the musts of the various types is confined to very narrow limits. (2) The *maximum* amount of nitrogen in the series of musts examined is over fourteen times greater than the *minimum*, or 0.188% as against 0.014% of nitrogen. (3) The greater part of the musts from grapes grown on the same plots, in different years, take up nearly the same amount of nitrogen each year. (4) The grapes from Tulare in the Great Valley, and from Mission San José of the Bay region, contain in their musts the highest nitrogen; the Coast Range Valley (Paso Robles) musts stand next; the Sierra Foothills musts are lowest, while Fresno (Valley) and Cupertino (Bay) musts stand intermediate between these and the Coast Range Valley. (5) The nitrogen withdrawn from the soil by grapes and held in their musts does not stand in any direct relation to the available *soil* nitrogen.

(*b*) *Wines.*—(1) The highest nitrogen averages in wines are found in the Bordeaux and Burgundy types as given. The other types examined contained, on the average, somewhat less than these, but resemble each other greatly. (2) Wines from the same grapes grown on the same plots in different seasons do not, on the whole, show much similarity in nitrogen. (3) The *maximum* amount of nitrogen found in wine is 0.124%, and the *minimum* was 0.007%. (4) The inference is rather against the significance of the amount of nitrogen present as controlling the keeping qualities of the wine. The influence, as far as it goes, probably lies more in the direction of the quality than of the quantity of the nitrogenous matters.

General Conclusions.—While the climate exerts a very great influence upon the nitrogen contents of all grape-musts, and especially upon the loss of nitrogen during vinification, a very great influence must also be ascribed to the soil; although the differences are not equal, or proportional, in different grape-varieties. It does not appear that the total amount of nitrogen present in grape-must bears any direct relation to the known keeping qualities of the wines, whether we compare different varieties or the same variety from different localities; and, until we have determined in what condition the nitrogen exists in the wine, it is impossible to define the influence, if any exists, that nitrogenous matters have upon the conservation or quality of wines. The subject is an exceedingly complicated one, because, as yet, there is no reliable method for the separation of the various nitrogenous bodies known as "albuminoids."

In those wines that show very wide differences in nitrogen contents in musts and wines there is probably a larger proportion of "albuminoids," while those with proportionately small amounts may be supposed to contain chiefly amido and imido compounds.

MISCELLANEOUS NOTES.

By F. T. Bioletti.

PRESERVATION OF FRESH GRAPES.

For four months in the year grapes are plentiful and cheap in California; for the other eight they almost disappear from the market. It is, therefore, very desirable to find some inexpensive and practicable way of keeping fresh grapes for as much of these eight months as possible. If this could be done it would be very profitable, as grapes kept till late spring or summer would increase three-fold in value.

In keeping grapes for any length of time there are two main dangers to be avoided—*drying up* and *mold*. If the grapes shrivel from loss of moisture they lose their character of fresh grapes and resemble raisins. If they are attacked by mold they are lost. Grapes for keeping should be handled with the greatest care. They should not be touched by the hand at all. In picking they should be handled by taking hold of the stem and laying them on straw, not allowing any bunch to lie on another. Only perfect and preferably loose bunches should be taken, all defective or bruised berries being carefully removed with a pair of scissors. The reason for such great care in handling is that the skin of the berry cracks very easily at the junction of the pedicel. This crack is often so small that it would not be noticed without careful scrutiny, but it gives an opening for molds and yeasts to enter the grape. A few grapes may start a growth of mold that soon envelops the whole bunch. It is also very desirable to retain as much as possible of the bloom of the grapes, and to do this there must be the minimum possible amount of contact between them and the hands.

Certain tough-skinned grapes strongly attached to the pedicel may be kept without much difficulty till Christmas or the middle of January by simply hanging them up or laying them on straw in a fairly dry room of even and low temperature. By January, however, they become much shriveled. Some fleshy grapes, such as the Almeria or Tokay, do not show the effects of loss of water so quickly. By the Thomery method of keeping a piece of vine wood, attached to the bunch, in a vessel of water, the grapes may be kept several weeks longer. This method, however, is troublesome and expensive; the water must be kept disinfected by wood-charcoal, and the bunches gone over carefully very often to remove decaying berries.

The Spanish method of packing the grapes in cork-dust is excellent for very hard grapes, such as the Almeria, but does not do for more delicate varieties. On account of the expense of cork-dust, attempts have been made to use sawdust as a substitute. There are several strong objections to its use, however. Even the most odorless sawdust communicates a taste to grapes after a few months. The hygroscopic nature of sawdust is very much against its use, especially if it is fine. If too dry it extracts moisture from the grapes, and if moist it favors the

growth of mold. A process of treatment invented by Mr. Shepard seems likely to overcome both these objections.

All these methods aim to protect the grapes from mold by surrounding them with a dry atmosphere, and all fail to keep any but the coarsest varieties for the full eight months, on account of the drying up of the moisture in the berries. Other methods have been tried, the leading principle of which is to keep the grapes in an atmosphere saturated with moisture, thus preventing all shrinkage, and to avoid mold by the use of a very low temperature or antiseptics. Sulphurous acid gas preserves the grapes from mold without injuring their appearance, except for a slight bleaching, but the grapes soon contract a sulphurous taste, besides having their natural one destroyed, thus rendering them uneatable. The use of an atmosphere saturated with alcohol fumes has been tried in France, it is said, with great success. According to experiments made here, however, it is hardly to be recommended. Finally, the use of carbonic acid gas has been tried. The last is the most promising, judging by the few experiments made here.

Experiments at this Station.—During the vintage of 1894 an attempt was made to preserve grapes in sawdust. The varieties experimented on were Napoleon, Zabalkanski, Huasco, Muscat of Alexandria, and Purple Cornichon from Tulare. Spruce sawdust was used, as having comparatively little taste. The sawdust was spread out in a thin layer and exposed to the sun until quite dry. It was then allowed to cool, and used to pack the grapes in the boxes at the vineyard. The packed grapes were then shipped to Berkeley, where they were allowed to remain in the same boxes. They arrived in perfect condition on November 1st. They all kept fairly well for a month; after this they commenced to decay or shrivel. At six weeks the Huasco and Muscat were all decayed. The Cornichon was less attacked by mold, but soon shriveled. The Napoleon and Zabalkanski kept best, but in two months none of them were in marketable condition. Even those which were not decayed had a slight mawkish taste due to the sawdust. The results, then, were inferior to those already obtained by keeping the grapes on straw or hung up on strings. This is partly owing to the impossibility of removing the decayed grapes before they infect the others.

In order to make a preliminary test of the relative merits of alcohol vapor, carbonic acid gas, and sulphurous fumes, the following experiments were made at the laboratory:

No. 1. A bunch each of Sultana, Gros Colman, and Verdal were hung up in a box made of a five-gallon coal-oil can. The grapes were received on September 30, 1895, from Tulare. They were washed with a spray of water and put immediately into the box. A small, wide-mouthed, two-ounce bottle of alcohol was put in the bottom of the box, which was hermetically sealed with paraffine. All the grapes kept their appearance perfectly for five months, only a few turning brown. At the end of nine months most of the white grapes had turned brown, but the Gros Colman looked as if they had been just picked from the vines. They all, however, tasted strongly of alcohol and somewhat of vinegar. Many of the Verdal berries had fallen off the bunch. There was no mold on any of them. The turning brown seems to have been caused by a small yeast or torula which enters the grapes at the junction with the pedicel.

No. 2. Four bunches of Black Prince and Mission grapes received from Tulare, September 30, 1895, were placed in a box similar to that used in experiment No. 1. The only difference of treatment was that the grapes were dipped in a weak solution of sulphurous acid before being hung up. The results were similar, except that fewer berries turned brown. They all, however, had acquired a strong taste of alcohol and vinegar, which made them unfit for eating. The appearance of the Mission grapes was particularly fine. At the end of nine months they looked as though just picked from the vine, being unshriveled and covered with bloom.

On November 2, 1895, another series of experiments was made. The grapes used were Pizzutello, Purple Cornichon, Flame Tokay, and Zabalkanski from Tulare. Five tin boxes were prepared in the same way as for the first two experiments, and a bunch of each variety placed in each box. The boxes were covered inside and out with a coating of paraffine to prevent rusting.

No. 3. The box was left open to the air as a control test. In nine days the Pizzutello grapes were turning brown and, with the Tokay, were becoming moldy. The Zabalkanski and Cornichon were still in good order. In twenty days all the grapes were moldy.

No. 4. Sulphur was burned in the box as soon as the grapes were put in, in order to sterilize them. The next day the box was filled with carbonic acid, and hermetically sealed. At nine and at twenty days all the grapes were good. At two months some of the gas had leaked out, but the grapes were all in good order and the box was refilled with carbonic acid. At the end of four months all the grapes appeared good, showing no sign of rotting or mold. They were as plump as when put in, showing no sign of cracking or shriveling. Even the delicate skin of the Pizzutello was uninjured. All of them, however, had acquired a strong taste of the paraffine with which the box was coated. At the end of nine months the grapes were still in the same condition, except that a few were becoming moldy on account of a small crack in the cover, through which mold spores had obtained entrance.

No. 5. This was a repetition of experiment No. 2, and gave the same results.

No. 6. After the grapes were put in the box, sulphur was burned beneath them and the box hermetically sealed. All the grapes were good at the end of twenty-two days, when a stream of sulphur fumes was drawn through the box. At the end of four months the grapes were all good, except that they had the same disagreeable taste of paraffine, which spoiled the grapes in experiment No. 4. At the end of nine months there was little change. The colored grapes were a little bleached and some of the white grapes had turned brown. The Cornichon and Tokay looked as well as when gathered, but the Pizzutello and Zabalkanski were inferior in appearance to those in the carbonic-gas experiment.

No. 7. This was identical with No. 4, except that a little alcohol and corrosive sublimate were placed at the bottom of the box. The results for the first four months were the same as in experiment No. 4, but after this the grapes became moldy, on account of a leak in the box.

ANALYSES OF MUST OF PRESERVED GRAPES, JUNE 29, 1896.

Name.		Sugar by Copper Test.	Acid as Tartaric.
Black Prince	Experiment No. 2	14.70%	0.99%
Mission	Experiment No. 2	13.30	0.68
Corinchon	Experiment No. 4	16.90	0.23
Corinchon	Experiment No. 6	17.90	0.26
Zabalkanski	Experiment No. 6	18.20	0.49
Pizzutello	Experiment No. 6	18.60	0.21
Flame Tokay	Experiment No. 6	19.90	0.25

These experiments, although in no case successful in preserving grapes in perfectly marketable condition, are very promising, and show that at least their appearance can be kept perfect. They show also the ease with which grapes, under the conditions of the experiments, take up odors, and the necessity of keeping them protected from anything that is liable to give them a bad flavor. It is for this reason that the use of carbonic acid gas will, in all probability, be preferable to the use of either alcohol or sulphur fumes. As may be seen from the above table of analyses, made by Mr. G. E. Colby, in experiments Nos. 4 and 6 the grapes had maintained their usual sugar and acid contents practically unchanged, showing that no appreciable effect had been caused by molds or yeasts. In experiment No. 2, however, there had been a notable decrease of sugar due to fermentation, and increase of acid due to acetic bacteria.

SUNSTROKE OF THE VINE.

At the beginning of August, 1895, complaints were received from Fresno that a large number of isolated vines were dying of some unknown disease. At the request of Mr. Owen, manager of the Butler estate, a visit was made to the vineyard and the trouble investigated.

In various parts of the tract, isolated vines were losing their leaves, the grapes were being destroyed by the sun, and in the worst cases the vines were killed. Mr. Owen, under the impression that the vines were attacked by some kind of mildew, had sprayed them with Bordeaux mixture, and believed that he had succeeded in arresting the evil; of this, however, no evidence could be seen.

The symptoms of the disease were the following: The leaves gradually, or sometimes rapidly, dried up and fell off, leaving the shoots exposed and allowing them to be killed by the sun. The vines first showed effects of the trouble in the early part of the summer, and some of those first attacked, though losing all their leaves, partly recovered and sent out new leaves. The leaves when first attacked often became spotted in a way somewhat resembling the Anaheim disease, but with the important difference that the line between the healthy tissue and the dead was clearly marked with little or no diseased tissue between. The appearance of the leaves is fairly well shown in the accompanying figure taken from a photograph.

The specimens of leaves and fruit brought to Berkeley were examined, but no sign of fungous parasites could be found. The trouble occurred equally in all parts of the vineyard on young and on old vines, but

PLATE III. LEAVES OF VINES INJURED BY SUNSTROKE.

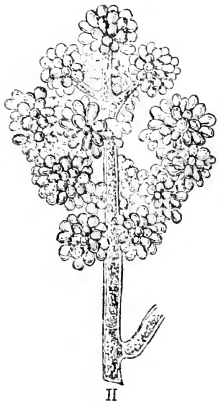
much more on the Muscats than on the stronger-growing Sultanas. The trouble is apparently simply a drying up of the vine, caused by a lack of adjustment between the water evaporated from the leaves and that taken up by the roots. The primary cause is probably the abrupt changes in the bottom water-level.

The trouble is that known in France as "folletage," and is physiological and not properly pathological in its character. It is thus described by G. Foëx: "Folletage occurs ordinarily in July or August, on vines which, up to the time of attack, have been healthy and vigorous. There are no preliminary symptoms. Isolated vines or patches of vines show a wilting of the leaves, which gradually fade and die; the shoots commence to dry up from the tips, and soon the whole vine dies. Sometimes the vine is less severely attacked and does not die. It receives, however, a severe check, from which it rarely recovers completely. It is particularly common in rich, deep soils which are damp and where the water-level is high, especially in wet years, and when the soil is poorly drained."

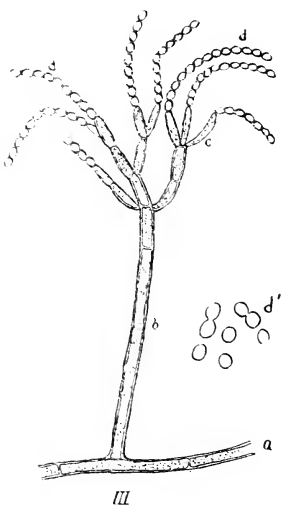
It may be caused by anything which disturbs the equilibrium between the water evaporated from the leaves and that taken up by the roots. A sudden period of dry, hot weather may cause more evaporation from the leaves than can be counteracted by the absorbing action of the root hairs. A sudden rise or fall of the water-level may cause the destruction of the root hairs, and thus render the vine incapable of replacing the evaporated water. In the case of the Fresno vines it is doubtless a combination of these two conditions that is responsible for the damage. There is practically no cure if the vine is badly affected. It is, therefore, very important to avoid the evil by careful management of irrigation and a close attention to the water-level.

BOTRYTIS CINEREA.

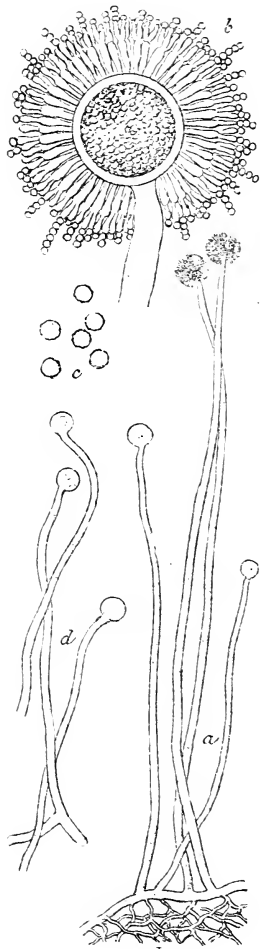
The *Botrytis cinerea* is the famous "noble mold" of the Rhine and Sauterne wine districts. It is known as *Edelfäule* by the Germans, and as *Pourriture noble* by the French. As these names indicate, it is held in esteem and is considered beneficial to the wine. It appears about vintage time as a grayish-yellow, powdery mold upon the surface of the grape. Its main effect upon the grape is to soften and partially disintegrate the skin. This, in dry weather, allows a certain degree of evaporation and concentration of the juice of the grape. This is a very valuable result for countries where the grape ripens with difficulty, or where an especially heavy must is desired. In wet weather, however, this thinning of the skin is dangerous, as it allows the absorption of water and the growth of harmful molds which are liable to displace the *Botrytis*. According to Müller-Thurgau, after the *Botrytis* has penetrated the skin of the grape it lives more at the expense of the acids than of the sugar of the must. Thus, while the sugar is increased by the evaporation of water, the acid is decreased by the direct action of the mold. The mold also renders a part of the soluble albuminoids of the must insoluble, which results in a slower fermentation. The *Botrytis* is reputed to give a slight and agreeable bitterness to the wine of the grapes which it attacks. It gives none of the disagreeable "moldy" taste which is so characteristic of the commonest mold, *Penicillium glaucum*.



II



III



I

PLATE IV. GRAPE MOLDS.

I. *Aspergillus niger.* (After Duclaux.)
   a. Fruiting hyphæ.
   b. Sporocarp showing formation of spores.
   c. Spores enlarged.
II. *Botrytis cinerea.* (After Ravaz.)
III. *Penicillium glaucum.* (From skin of moldy grape.)
   a. Mycelium or vegetative part.
   b. Fruiting hypha.
   d. Chains of spores. *d'.* Spores enlarged.

The presence of *Botrytis cinerea* on California grapes was first noted by Mr. A. P. Hayne during the vintage of 1893. He found it very common at several vineyards in the neighborhood of St. Helena, Napa County, and later at Mountain View, Santa Clara County. It has also been noticed at Mission San José, Alameda County, and at Asti, Sonoma County. It probably occurs all over California whenever the conditions are favorable. As some careful wine-makers were rejecting the grapes attacked by this mold or relegating them to the distillery, several experiments were made to determine the kind and degree of action which the mold had on wine. The conclusion was that a small quantity of the mold had no appreciable effect, but that if the grapes were badly attacked the resulting wine was apt to have a Sherry taste, doubtless on account of the preliminary oxidation of the must through the partially disintegrated skin of the grape. As, on the contrary, other molds are well known to have a very injurious effect on the flavor of wine, it is important to distinguish between them and the *Botrytis;* therefore, a short description of *Botrytis cinerea*, of *Penicillium glaucum*, and of *Aspergillus niger*, the molds which are found most abundantly on grapes in California, will be useful.

The *Botrytis cinerea* is but a form of the *Sclerotinia Fuckeliana*, a fungus which is common on all parts of the vine. As it is the only form which at all affects wine-making, it is the only one described here. It appears on the surface of the ripe or nearly ripe grapes as a thick olive-gray layer. This layer consists of the mycelium or fungal threads covered with masses of spores. The microscopic view of the fungus may be seen in Fig. II. It will be noticed that the spores are in roundish bunches, and not joined together in chains as are those of *Penicillium.*

Penicillium glaucum is the common blue mold, found on almost all kinds of fruit which have been kept for a length of time in a damp place. In general, it can be distinguished from *Botrytis* by its bluish-green color and moldy odor. As may be seen by the microscopic view in Fig. III, the spores are in chains, which all have their origin at the ends of short branches springing from the end of a fruiting hypha or filament. This mold is seldom found in quantity on grapes before they are picked, except in rainy weather. It usually develops in the boxes and can be avoided by crushing the grapes as soon as possible after picking.

Aspergillus niger is the black mold which annually destroys tons of grapes in the warmer and irrigated portions of California. On account of its black color it cannot be mistaken for either of the above molds. Fig. I shows its microscopical characteristics. It attacks grapes which have closely packed bunches and tender skin. It is especially harmful to Zinfandel grown on irrigated land, and sometimes destroys the whole crop before it is ripe enough to gather. The best method of prevention is to adopt a method of pruning and training that will not permit the bunches of grapes to press against each other and which will allow a free circulation of air between them.

LIST OF VITICULTURAL PUBLICATIONS OF THE COLLEGE OF AGRICULTURE, AND OF ALL PUBLICATIONS OF THE LATE VITICULTURAL COMMISSION.

The publications of the University Experiment Station will be sent free to any address on application to the Director.

The large number of reports of the late Viticultural Commission, which were transferred to the Experiment Station by Act of the Legislature, can also be had on application, when accompanied by the necessary postage, as shown in the list given below. These State reports are not included in the class of Station publications allowed by Act of Congress to pass free through the mails. While the Viticultural Commission, with its annual appropriation of $15,000, could well afford to spare enough for postage on its reports, the Station cannot thus draw on the small sum of $2,500 given to the University to carry on the viticultural work.

REPORTS OF THE COLLEGE OF AGRICULTURE.

Date of Issue.	Title.	Postage.
1886....	**Report of Viticultural Work during the Seasons of 1883-84 and 1884-85.**	Free.
	Contents:	
	Legislation concerning viticultural work.	
	Statement of general objects and plan of work.	
	Report of Committee of State Viticultural Convention of 1884.	
	Wine Fermentation:	
	The several fermentations; ferments.	
	Circumstances that determine the several fermentations.	
	Influence of temperature.	
	The lacto-butyric, mucous, and mannite fermentations.	
	The acetic fermentation.	
	Conservation of wines.	
	Points in the fermentation of red wines.	
	Extract of report on "Studies on Wine Fermentation."	
	Record of work in the viticultural laboratory for the season 1883-84.	
	Tables showing proportions of pomace, must, etc., and composition of wines.	
	Descriptive list of wine samples received 1883-84.	
	Composition of Zinfandel wines.	
	Record of work in the viticultural laboratory for the season 1884-85.	
	Descriptive list of grapes received and wines made, with analyses of musts and wines.	
	Descriptive list of wines sent for examination during season 1884-85.	
	The vintage of 1885.	
	University experimental plot at Cupertino.	
	Record of work relating to the phylloxera.	
	Mercury vapor as a remedy against the phylloxera.	
	The phylloxera at Berkeley.	
1886....	**Report of Viticultural Work during the Seasons 1885 and 1886**	Free.
	Contents:	
	General objects and plan of work.	
	The new viticultural building.	
	Collection of vine specimens.	
	Colorimetric measurement of wines.	
	Vintage and wines of 1885.	
	Descriptive list of grapes, musts, and wines analyzed 1885-86.	
	Condensed grape-must and its uses.	
	Dr. Springmuehl's book on Italian wines.	

REPORTS OF THE COLLEGE OF AGRICULTURE—Continued.

Date of Issue.	Title.	Postage.
1886....	**Report of Viticultural Work during the Seasons 1885 and 1886**—*Cont...*	
	Descriptive list of wines received for examination and analysis in 1885.	
	Remarks on the vintage and work of 1886.	
	Descriptive list of grapes received and analyses of musts and wines.	
	Experiments on methods of fermentation.	
	The experimental vineyard at Cupertino.	
	Decrease and change of color after fermentation.	
	Vine mildew and its treatment.	
	Phylloxera-resistant vines.	
	Coulure of the vine.	
	A supposed vine disease in Los Angeles County.	
	The mercurial phylloxera remedy.	
1888....	**Reports of Experiments on Methods of Fermentation and Related Subjects**	Free.
	Contents:	
	Composition of wines made by different modes of fermentation.	
	Fermentation under different conditions; effect of temperature.	
	Revival of fermentation.	
	Zinfandel fermentations.	
	Behavior of highly saccharine musts.	
	Extraction of color during fermentation.	
	Effect of climate on composition of musts.	
	Aëration.	
	Pasteurization of wines.	
	Red wine from condensed must by the Springmuehl process.	
1892....	**Report of the Viticultural Work during the Seasons 1887-89**	Free.
	Contents:	
	Part I. Red-wine grapes.	
	General objects and plan of the viticultural work.	
	Colorimetric measurement of wine.	
	Viticultural stations under private auspices.	
	Descriptive list of grapes received, and of musts and wines analyzed 1887-89.	
	Pasteurization of wines.	
	Sterilization of wine by filtration.	
	Application of electricity in the aging and conservation of wines.	
	Use of ozone in aging and the conservation of wines.	
	The sweet-wine investigation.	
	Carpene's new methods of analysis of raw materials containing tartrates.	

PUBLICATIONS OF THE STATE VITICULTURAL COMMISSION.

Date of Issue.	Title.	Postage. Bound.	Postage. Unbound.
1881....	**Report of the Board of State Viticultural Commissioners for 1881**		6 cents.
1881....	**Report of the Board of State Viticultural Commissioners for 1881.** Second edition; revised		5 cents.
	Contents:		
	Acts of the Legislature.		
	Reports of President, Officers, and Members of the Board.		
	Diseases of vines.		
	Raisin-making in Spain.		
	Wild vines of California and Arizona.		
	Seedlings.		
	Vine of the Soudan.		
	California wines.		
	Permanent maintenance of our vineyards.		
	Appendix A-H, J. Phylloxera and its treatment.		
	Appendix I. Grafting American vines.		
	Sessions of the Board.		

PUBLICATIONS OF THE STATE VITICULTURAL COMMISSION—Continued.

Date of Issue.	Title.	Postage. Bound.	Unbound.
1882	**Report of the Chief Viticultural Officer for 1881** *Contents:* Phylloxera; Resistant vines; Grafting. Appendix A. Reconstruction of southern vineyards. (Foëx.) Appendix B. Wild vines of America. (Millardet.) Appendix C. Carbon bisulphide and sulpho-carbonates. Appendix D. Report of Committee on Vine Pests.	8 cents.	6 cents.
1884	**Report of the Chief Viticultural Officer for 1882-84** *Contents:* Part 1. Original investigations. Part 2. Viticultural industry in California. Part 3. Culture of the vine in California. Part 4. Ampelography. Part 5. Pruning, training, and maintenance of the vine. Part 6. Diseases and pests. Part 7. Miscellaneous.		5 cents.
1888	**Report of Board of Viticultural Commissioners for 1887** *Contents:* Report of President of the Board. Index to some reports of Board. Statistics of exports of wines and brandies. Reports of Commissioners. Report of Secretary of Board. Catalogue of books in Viticultural Library. Report of Chief Viticultural Officer. *Oïdium Tuckeri*, and the use of sulphur. The pure-wine bill. Bleaching Seedless Sultana raisins. How to avoid and correct imperfect fermentation. Vineyards in the south of France. Treatment of wine by electricity. Herbaceous grafting. Report of the State Analyst. Arsenic remedy for grasshoppers.	6 cents.	4 cents.
1888	**Report of the Sixth Annual Convention** *Contents:* Raisin-making; Table and shipping grapes. Resistant vines and grafting. Vine pests and remedies. Chaintre system of pruning in California. Wine cellars for interior valleys. Wine-making machinery and cellar construction. Wine and brandy-making as a profession. Electro-magnetism for aging wine. Sherry flavors in wine. Fermentations at Viticultural Laboratory. Distillation of grape brandy. Temperance reform. Fermentation and California wines. Sophistication of wines. Our markets for wine, and wine-storage. How to drink wine: wine as a temperance agent.	7 cents.	5 cents.
1889	**Wines.** By R. Boireau; translated by E. A. Schneider *Contents:* A short treatise on vinification. Care and treatment of wines in cellar and store.	6 cents.	4 cents.
1890	**Report of the Board of State Viticultural Commissioners for 1889-90** *Contents:* Report of President and officers. Report of E. Dowlen on Anaheim disease. Raisins. Resistant vines in Sonoma. Tariff and sweet-wine bill.	9 cents.	7 cents.

PUBLICATIONS OF THE STATE VITICULTURAL COMMISSION—Continued.

Date of Issue.	Title.	Postage. Bound.	Postage. Unbound.
1890	**Report of the Board of State Viticultural Commissioners for 1889-90**—*Continued.*		
	Appendix:		
	Resistant vines.		
	California grape-hopper.		
	Destruction of animal and vegetable parasites.		
	Grafting Muscats.		
	Wines. By R. Boireau; translated by E. A. Schneider.		
	A short treatise on vinification.		
	Care and treatment of wine in cellar and store.		
	Import duties of various countries.		
1891	**How to raise the price of grapes, and an analysis of the sweet-wine law**		1 cent.
1891	**Report of George West for 1891**		1 cent.
1891	**Directory of the grape-growers, wine-makers, and distillers**		6 cents.
1892	**Report of the Board of State Viticultural Commissioners for 1891-92**	9 cents.	7 cents.
	Contents:		
	Reports of officers of the Board.		
	Appendix B. Transactions of the Eighth Viticultural Convention.		
	Appendix C. Utilization of wine residues, by A. Dal Piax.		
	Appendix D. Import duties of various countries.		
	Appendix E. Wine: Classification, tasting, qualities, and defects. By G. Grazzi-Soncini.		
	Resistant vines.		
1892	**Wines: Classification, wine-tasting, qualities, and defects.** By G. Grazzi-Soncini; translated by F. T. Bioletti	5 cents.	
1892	**Appendix A to Report for 1891-92. Brandy distillation**	6 cents.	4 cents.
1892	**The vine in Southern California**		1 cent.
1893	**The vineyards of Southern California**	4 cents.	2 cents.
1893	**The vineyards of Alameda County**	4 cents.	1 cent.
1893	**Grape syrup**	4 cents.	2 cents.
1894	**Report of the Board of State Viticultural Commissioners for 1893-94**		5 cents.
	Contents:		
	Reports of Officers and Commissioners.		
	Amended sweet-wine law.		
	Appendix C. Midwinter Fair display.		
	Appendix D. Phylloxera of the vine. By V. Mayet.		
	Appendix E. Possible trade in Mexico.		
	Appendix F. Tariff of various countries.		
1894	**Treatise on Wine Production**		4 cents.
	Contents:		
	Part 1. Types of European vintages. Conditions affecting the quality of California wines.		
	Part 2. California wines at the World's Columbian Exposition.		
	Part 3. Tariff and internal revenue taxes.		
	Part 4. Chemical analyses of California wines.		

Of some of the early reports of the Viticultural Commission the supply is so nearly exhausted that they cannot be offered for general distribution, and hence are not included in the enumeration.

INDEX.

The page on which will be found the special description of each variety of grape, together with the analyses of its musts and wines, and the records of treatment and tasting during vinification, is given in full-face type.

A

B